BARGO

MULTI PURPOSE RUGGED COLOUR DISPLAY

MPRD 9600

TECHNICAL MANUAL



Barco n.v. Display Systems

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MULTI PURPOSE RUGGED COLOUR DISPLAY

MPRD 9600

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SERVICE SAFETY PRECAUTIONS

WARNING: X-RADIATION

X-RADIATION CAN BE CAUSED IF CRITICAL COMPONENTS ARE REPLACED BY NON-CONFORM COMPONENTS. THESE COMPONENTS ARE MARKED IN THIS SERVICE MANUAL BY AN *.

WARNING: SAFETY

ELECTRIC SHOCK OR FIRE HAZARD CAN BE CAUSED IF CRITICAL COMPONENTS ARE REPLACED BY NON-CONFORM COMPONENTS. THESE COMPONENTS ARE MARKED IN THIS GUIDE BY A A SIGN.

REPLACE WITH CONFORM TYPES ONLY!

- 1. Comply with all caution and safety-related notes on or inside the instrument cabinet, on the chassis, or on the picture tube.
- When service is required, maintain correct lead dress and parts placement.Extra precaution should be taken to assure proper lead dress in the High Voltage circuit area.

Where a malfunction has occurred, those components or circuits that indicate evidence of abnormality should be replaced or corrected. Always use the manufacturer's safety specified replacement components.

- 3. Do not remove, install or handle the picture tube in any manner unless shatter-proof goggles are wom. People not so equipped should be kept away when picture tubes are handled. Keep the picture tube away from the body while handling.
- 4. Protective shields are provided on this chassis for the protection of both the service technician and the customer.

Protection shields removed for service convenience must be re-installed correctly and ANY MISSING SHIELD MUST BE REPLACED. DO NOT OPERATE THIS INSTRUMENT WITHOUT THE PROTECTIVE SHIELDS IN POSITION AND PROPERLY SECURED.

5. After any service intervention, the service technician must be sure that no protective device built into the instrument by the manufacturer has become

defective, or inadvertently defeated during servicing. Therefore, the following checks are recommended for the continued protection of the customer and service technician.

GROUNDING CONTINUITY TEST

- Remove main plugs from wall outlet.
- With an Ω -meter in its lowest resistance range, measure resistance between the grounding prong of the mains plug and all accessible conductive parts. THE METER MUST BE READ ZERO OHM.
- The mains plug still being removed from the wall outlet, switch on the instrument.
- Switch an Ω -meter in its highest resistance range, measure resistance between the grounding prong of the mains plug and the two other prongs of the mains plug.

BOTH METER READINGS HAVE TO BE MORE THAN 5 MEGOHM (5 M Ω).

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE, THE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND CORRECTIVE ACTION MUST BE TAKEN BEFORE RETURNING THE INSTRUMENT TO THE Customer.

X-RADIATION AND HIGH-VOLTAGE LIMITS

The primary source of X-radiation in solid state display units is the picture tube. The picture tube is specially constructed to limit X-radiation emissions. The shields and mounting hardware for picture tubes have an X-radiation protection function and must be properly in place.

For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter. High voltage is maintained within specified limits by the use of close tolerance safety related components/ adjustments in the power supply circuit. Refer to the technician X-radiation warning note on the Chassis Schematic and Instrument Labels in the Basic Service Data for specific high-voltage limits of each chassis and X-radiation Protection Circuits. If high voltage exceeds specified limits, check each component specified in the chassis schematic diagram and take necessary corrective action.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in display units have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by then necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Data and its Supplements and Bulletins. Electrical components having such features are identified by \triangle or * on the schematics and on the parts lists in this Data and its Supplements and Bulletins. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the parts lists in this Data and its Supplements and Bulletins, may create shock, fire, or excessive X-radiation.

NOTE FOR USERS IN THE UNITED KINGDOM

IMPORTANT:

The wires of the mains lead are coloured in accordance with the following code:

Green and Yellow: EARTH Brown: NEUTRAL Blue: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- The wire which is coloured Green and Yellow must be connected to the terminal in the plug which is
- marked by the letter E or by the safety earth symbol ____ or coloured Green and Yellow.

 The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Black.
- The wire which is coloured Brown must be connected to the terminal which is marked with the letter L or coloured Red.

WARNING: This apparatus must be earthed.

BARCON.V. Display Systems 9600 SERIES

IMPORTANT NOTICE

The material in this manual consists of information which is the property of **BARCO** N.V. Display Systems and is intended only for use by the purchasers of the type of monitor described in this manual.

9600 SERIES Monitors contain material in which **BARCO** N.V. Display Systems retains proprietary rights. Any act involving software reproduction or intervention is prohibited.

NOTE: This equipment has been tested and found to comply with the limits of a class A digital device, persuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmfull interference in which case the user will be required to correct the interference at his own expense.

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This technical manual could include inaccuracies or typographical errors. Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible.

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DIESES TECHNISCHE HANDBUCH SOLLTE SORGFÄLTIG GELESEN WERDEN BEVOR DIE NETZSPANNUNG ANGELEGT WIRD

ACHTUNG RÖNTGENSTRAHLUNG!!

ERHÖHTE RÖNTGENSTRAHLUNG KANN VERURSACHT WERDEN, WENN BESTIMMTE BAUTEILE DURCH TEILE ERSETZT WERDEN DIE NICHT DER SPEZIFIKATION DES HERSTELLERS ENTSPRECHEN. SOLCHE BAUTEILE SIND IN DIESER WARTUNGSANLEITUNG DURCH EIN * GEKENNZEICHNET.

ACHTUNG SICHERHEIT!!

WERDEN BESTIMMTE BAUTEILE DURCH TEILE ERSETZT, DIE NICHT DER SPEZIFIKATION DES HERSTELLERS ENTSPRECHEN, SO KANN EIN ELEKTRISCHER SCHLAG ODER BRANDGEFAHR DIE FOLGE SEIN. SOLCHE BAUTEILE SIND IN DIESER WARTUNGSANLEITUNG DURCH EIN AGKENNZEICHNET.

WARTUNG

VOR DEM ÖFFNEN DES MONITOR IST DIESER AB ZU SCHALTEN!

- Sämtliche Sicherheitsvorschriften auf der Außen- oder Innenseite des Gerätes bzw. auf der Bildröhre sind zu beachten
- Ist eine Wartung erforderlich, so ist die richtige Verdrahtung und die korrekte Einbaulage der Teile zu beachten.
 - Es ist besonders darauf zu achten, daß im Hochspannungsbereich eine korrekte Lage gewahrleistet bleibt. Nur solche Ersatzteile verwenden, die der Spezifikation gemäß den Sicherheitsvorschriften des Herstellers entsprechen.
- Vor dem Ausbau der Bildröhre ist die Anodenleitung und die Anode der Bildröhre gegen den Chassisrahmen zu erden, damit eine vorhandene Ladung abgeleitet werden kann.
 - Beim Aus- oder Einbau oder bei sonstiger Handhabung der Bildröhre muß eine Schutzbrille getragen werden. Wer keine derartige Schutzbrille trägt, darf sich nicht in den Bereich aufhalten, wo Bildröhren gehandhabt werden. Bildröhren sind bei ihrer Handhabung vom Körper weg zu halten.
- Nach erfolgter Wartung muß der Kundendiensttechniker sicher sein daß während der Wartung keine vom Hersteller eingebaute Schutzvorrichtung beschädigt oder unabsichtlich zerstört wurde.
 - Es empfiehlt sich daher, zum Schutz der Kunden und des Technikers folgende Kontrollen durchzuführen:

SCHUTZLEITERANSCHLUß UND BERÜHRUNGSCHUTZ

- Netzstecker aus der Steckdose ziehen.
- Mit einem auf kleinsten Widerstandsbereich eingestellten Ohmmeter den Widerstand zwischen der Erdung des Netzsteckers und allen zugänglichen leitenden Teilen messen.
 - AM OHMMETER MUB < 0.1 OHM GEMESSEN WERDEN.
- Bei weiterhin gezogenem Netzstecker, das Gerät einschalten.
- Mit einem auf höchsten Widerstandsbereich eingestellten Ohmmeter den Widerstand zwischen der Erdung des Netzsteckers und den beiden anderen Stiften des Netzsteckers messen.
 - ES MÜSSEN JEWEILS MEHR ALS 5 MEGOHM ABGELESEN WERDEN.

ERGEBEN DIE MESSUNGEN ABWEICHENDE WERTE, SO KÖNNTE DAS AUF EINE GEFÄHRLICHE BERÜHRUNGSSPANNUNG HINDEUTEN, SODAß ABHILFE GESCHAFFEN WERDEN MUß, BEVOR MAN DAS GERÄT DEM KUNDEN ZURÜCKGIBT.

Die Bildröhre ist Hauptverursacher von Röntgenstrahlung. Sie hat eine besondere Bauform um die Röntgenstrahlung auf ein Mindestmaß zu begrenzen.

Die Ersatzröhre muß vom gleichen Typ sein wie die Originalröhre, damit ein dauerhafter Schutz vor Röntgenstrahlen gewahrleistet ist.

Durch den Einbau von besonders maßgenauen Sicherheits Bauteilen / Abgleichungen im Netzteil wird die Hochspannung innerhalb der angegebenen Grenzwerte gehalten. Die für Techniker bestimmte warmende Hinweise im Schaltbild, bezüglich der Röntgenstrahlung sowie die bei jedem Gerät aufgeführten Hochspannungsgrenzwerte sind zu beachten.

Liegen die Hochspannungswerte über den dort aufgeführten Höchstwerten, so muß jedes im Schaltbild spezifizierte Bauteil kontrolliert- und die nötige Abhilfe geschaffen werden. Viele elektrische und mechanische Teile haben besondere Sicherheitsmerkmale. Bauteile die zu dieser Sicherheitskategorie gehören sind in den Schaltbildern und in der Stückliste dieser Wartungsanleitung sowie in den Nachträgen und Technischen Informationen mit einem

\(\begin{array}{c} \begin{array}{c} \text{ Wersehen.} \end{array} \)

Der Einsatz von Ersatzteilen, die nicht den Sicherheitsauflagen, denen die Ersatzteile der Stückliste dieser Anleitung, der dazugehörigen Nachträge und technischen Informationen unterliegen, genügen, kann einen elektrischen Schlag, Brand oder eine übermäßige Röntgenstrahlung zur Folge haben.

ACHTUNG: DIESES GERÄT MUß GEERDET WERDEN!

MPRD 9600 SERIES PRODUCT DESCRIPTION

The MPRD 9600 series offers 2 standard Multi Purpose Rugged color Displays, designed for reliable and safe operation under severe conditions.

CRT dimensions are 17" & 20".

Special 9600 features:

- AUTOLOCK: automatic syncronisation (47 - 94 Kc / 20") - (32 - 64 Kc / 17")

- AUTOSYNC: automatic selection between sync. on green or external sync. with priority for external sync.

- AUTOSET : automatic setting for all geometric and focus parameters

- high efficiency resonant converter power supply 28 VDC or 115/220 VAC
- built in test pattern generator to be able to control all display settings
- resonant degauss
- compact housing due to SMD / ASIC / HYBRID circuitry and state-of-the-art mechanical design
- ALL display settings software-controlled with keypad or remote
- full diagnose on keypad
- AKB (Automatic Kinescope Biasing)
- Differential video inputs with loopthrough, separated sync. or composite sync. loopthrough
- Softkey Control Panel with Ambient Light Controller

List of options described in this manual (section 9):

- Magnetic Immune System (MIS)
- Second RGB input
- Portrait version

Other options described in separate manuals:

- Power factor corrector
- Fibre Optics Inputs
- Touch Screen and Touch Screen Controller
- Extended vibration range
- Stereo shutter

How to get started: All standard and derived (optional) versions of the RGB boards, the Deflection boards, the Power Supply boards, the Control panels and CRT Socket boards are described in section 2.

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1. BOARD LOCATION

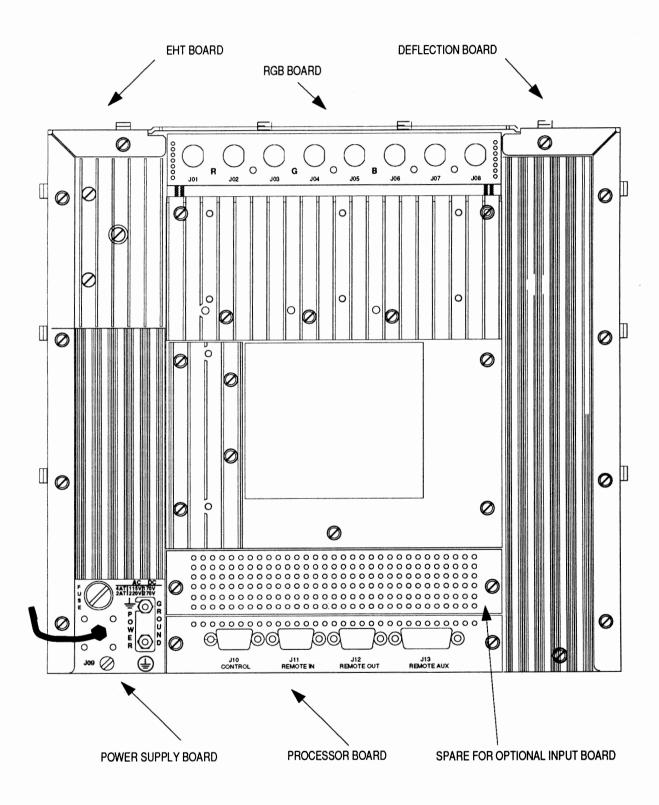


figure 1.1: rear view board location

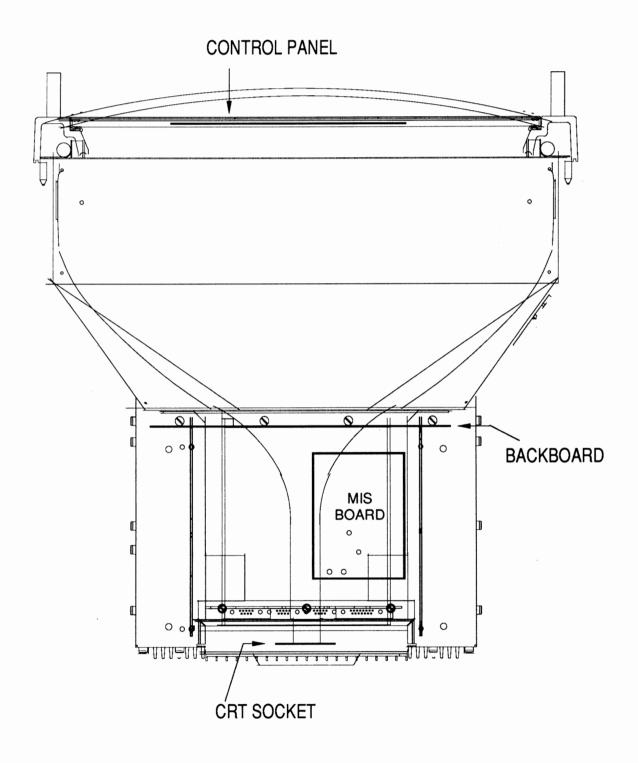


figure 1.2: top view board location

2. SCHEMATICS DESCRIPTION AND PARTS LISTS

PARTS LIST STRUCTURE AND COMPONENT CODIFICATION GUIDE.

All components of the MPRD9600 are stored in several parts lists.

The parts list of a complete monitor shows all units (V56xxxx).

All these units have their own parts list, each item has an order number, a short (coded) description, the BARCO SUPPLIER and - if it is an electronic component - a sequence number (e.g. R211, C107, Q32, U5).

EXPLANATION OF THE MPRD9600 DETAILED MODULE OVERVIEW

Each complete MPRD96xx monitor has one unique BARCO identification number, V95077yy

The complete standard MPRD9643/51 monitor consists of 14 units, each unit has a name and a unique BARCO identification number.

MOI	NITOR TYPE	MPRD9643	MPRD9651
1.	RGB BOARD (A)		V5631210
2.	PROCESSOR BOARD (C)		V5631220
3.	DEFLECTION BOARD (D)	V5631235	V5631230
4.	EHT BOARD (E)		V5631240
5.	CONTROL PANEL BOARD (O)		V5631260
6.	POWER SUPPLY BOARD (P)	V5631275 (1	10/220 VAC fixed cord) or
		V5631270 (1	10/220 VAC power plug) or
		V5631271 (28	3 VDC power plug)
7.	CRT SOCKET (T)		V5631280
8.	BACKBOARD (B)		V5631200
9.	FRAME		V5631180
10.	PICTURE TUBE	V5631195	V5631190
11.	FRONT	V5631135	V5631130
12.	RACKMOUNTING KIT	V5631295	V5631290
13.	75Ω TERMINATORS		VOPTO472
14.	FUSE SET 115/220		V5625745

Each unit is defined by a parts list containing all the parts necessary to assemble the unit. Each item in the parts list has an identification number Cxxxxx or Vxxxxx.

V75xxxx are printed circuit boards.

V68xxxx are parts lists of printed circuit boards with SMD components mounted on them.

- this parts list gives information on the SMD components mounted on the PCB,
- SMD components are identified by a Pxxxx identification number.

V56xxx within a module are programmed components (GALs, EPROMs, ...).



PICT. TUBE UNIT

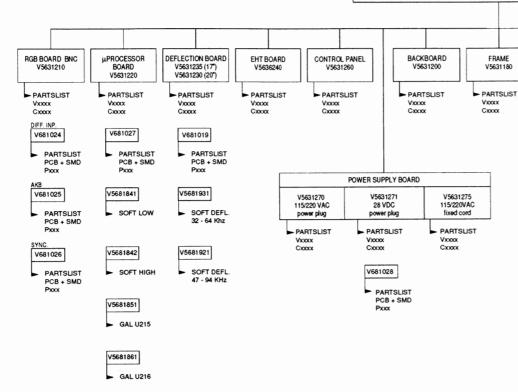
V5636195 (17")

V5636190 (20°)

PARTSLIST

Vxxxx

Cxxxx



2.2

BARCO N.V. DISPLAY SYSTEMS

MPRD 9600 MODULE OVERVIEW

DATE: 10/05/93

	т	
ORDER NUMBER	BOARD NAME	SHORT FORM BOARD DESCRIPTION
V5631212	RGB	TRIAX CONNECTORS
V5631213	RGB	TNC CONNECTORS INTERNALLY TERMINATED
V5631214	RGB	TNT CONNECTORS INTERNALLY TERMINATED
V5631217	RGB	TROMPETER CONNECTORS
V5631910	RGB	EQUALS V5631210 BUT COATED WITH FC722
V5631913	RGB	EQUALS V5631213 BUT COATED WITH H.SEAL 1B31
V5631914	RGB	TNT CONNECTORS AND COATED WITH FC722
V5631915	RGB	EQUALS V5631214 BUT COATED WITH FC722
V5631916	RGB	CERAMIC VERSION COATED WITH FC722
V5631920	PROCESSOR	EQUALS V5631220 BUT COATED WITH FC722
V5631921	PROCESSOR	EQUALS V5631220 BUT COATED WITH H.SEAL 1B31
V5631922	PROCESSOR	CERAMIC VERSION COATED WITH FC722
V5631231	DEFLECTION	MPRD9651 WATERCOOLED
V5631232	DEFLECTION	MPRD9651 32/64 KHz
V5631237	DEFLECTION	MPRD9643 40/80 KHz
V5631238	DEFLECTION	EQUALS V5631230 BUT WITH ADAPTED HEATSINK
V5631239	DEFLECTION	EQUALS V5631230 BUT WITH SHORT FLYBACK
V5631930	DEFLECTION	EQUALS V5631230 BUT COATED WITH FC722
V5631931	DEFLECTION	EQUALS V5631230 BUT COATED WITH H.SEAL 1B31
V5631932	DEFLECTION	EQUALS V5631232 BUT COATED WITH FC722
V5631933	DEFLECTION	CERAMIC VERSION COATED WITH FC722
V5636241	EHT	WATERCOOLED
V5636940	EHT	EQUALS V5631240 BUT COATED WITH FC722
V5636941	EHT	EQUALS V5631240 BUT COATED WITH H.SEAL 1 B31
V5636943	EHT	CERAMIC VERSION COATED WITH FC722
V5631261	CONTR. PAN.	FUNCTION KEYS MPRD9651 LANDSCAPE
V5631265	CONTR. PAN.	FUNCTION KEYS MPRD9643 LANDSCAPE
V5631267	CONTR. PAN.	VERSION UP
V5631960	CONTR. PAN.	EQUALS V5631260 BUT COATED WITH FC722
V5631961	CONTR. PAN.	EQUALS V5631261 BUT COATED WITH FC722
V5631962	CONTR. PAN.	EQUALS V5631260 BUT COATED WITH H.SEAL 1B31
V5631273	POW. SUPPLY	
V5631279	POW. SUPPLY	
V5631970	POW. SUPPLY	EQUALS V5631270 BUT COATED WITH FC722
V5631971	POW. SUPPLY	EQUALS V5631271 BUT COATED WITH FC722
V5631972	POW. SUPPLY	EQUALS V5631270 WITH MODIFIED POWER PLUG
V5631974	POW. SUPPLY	
V5631973	POW. SUPPLY	EQUALS V5631972 BUT COATED WITH H.SEAL 1B31
V5631975	POW. SUPPLY	EQUALS V5631275 BUT COATED WITH FC722
V5631282	CRT SOCKET	PORTRAIT VERSION
V5631285	CRT SOCKET	EXTENDED ALTITUDE
V5631980	CRT SOCKET	EQUALS V5631280 BUT COATED WITH FC722
V5631981	CRT SOCKET	EQUALS V5631282 BUT COATED WITH H.SEAL 1B31
V5631900	BACKBOARD	EQUALS V5631200 BUT COATED WITH FC722
V5631901	BACKBOARD	EQUALS V5631200 BUT COATED WITH H.SEAL 1 B31

FRONT

V5631135 (17°)

V5631130 (20°)

- PARTSLIST

Vxxx

Cxxxx

CRT SOCKET

V5631280

► PARTSLIST

Vxxxx

Cxxxx

RACKMOUNTING KIT

V5631295 (17*)

V5631290 (20°)

► PARTSLIST

Vxxxx

Cxxxx

BNC 75Ω TERMIN.

► PARTSLIST

Vxxxx

Cxxxx

VOPTO472

FUSE SET 115/220

V5625745

- PARTSLIST

Vxxxx

Cxxxx

COMPONENT CODIFICATION

Each parts list starts with the reference to the unit, the unit name and the number to order a complete unit.

The next line shows the column headings: ORDER NUMBER, DESCRIPTION and ITEM.

The order number is the company order number.

The description is a coded description of the component.

Item refers to the sequence number in the schematic diagram.

Note that only a reduced list is supplied in this manual, the complete list is available on request.

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7				height 7mm
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AX				axial
R.A.				radial
SN				snap in
CE			CERAMIC	
P 1 0 0			class 1,temp coeff	P100
NP 0				NPO
N 0 7 5				N075
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PO		+		polyester
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				D																		T	T	T	T	double side
				M																	T		T		1	multilayer
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								N		i														mounted on Wire
			П					R	+	1														mounted on flat or Ribbon cable
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						•	-	-	S															side entrance,input output angle 90∞
					_	_	;	_	В				-											bottom entrance, input output angle 360-
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								-		_		D												double input, top and bottom
								:	!				В											for printed circuit board
	:										-		W							Ļ				for wire terminal use on modified by barco special components
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ONNECTOR TYPE	DESCRIPTION	MANUFACTURER
1111	1 1	
23456789012		
1189	wire to wire or board connector	molex
1190	wire to wire or board connector	molex
1 2 9 2	wire to wire or board connector	molex
1 3 8 0	wire to wire or board connector	molex
1 9 5 1	wire to wire or board connector	molex
2870	wire to wire or board connector	molex
7 4 2 9	wire to wire or board connector	molex
7 4 3 0	wire to wire or board connector	molex
8020	wire to wire or chassis connector	elco
ALLIG	alligator terminal	
ANT	antenne connector	
BANAN	banana connector	
BAT	battery connector	alland about
BLOCK	terminal blocks	weiland,phoenix,wago
BNC	bajonet coax connector	amp,
BSC	wire and board interconn system	bsc
CHAMP	equivalent is the blue ribbon conn.	amp
CINCH	audio or video connector	
CIS	commercial interconnection system	amp
CRT	cathode ray tube connector	smk,hosiden,sony
D	d din connector common pcs	amp,burndy,souriau
D A 1 5	d din connector typical pcs d din connector typical pcs	
D B 2 5 D C 3 7	d din connector typical pcs	
DE 0 9	d din conn. typical pcs	
DE 0 9	d din conn. all pcs,double density	
DIP	dual in plastic connector	3m
EDGE	male connector is the pcb	amp
EE	sensor connector	omron
EHT	extra high tension connector	alden,hobson,sangyo
EMK01	coax connector	kathrein
EMK71	coax connector	kathrein
EMK76	coax connector	kathrein
EURO	euro din connector din41612	amp,burndy
FFC	flat flex connector, ziflo	burndy,amp,sumitomo
FLEX	connector for sil cable 1,27	3m
Н :	wire to board conn. pitch 2,5mm	jst
HONDA	video audio connector	smk
JUMP	jump conn. between pcm 2,5/2,54	amp,
LS	speaker connector	preh,
LV	wire to board conn. pitch 6,2mm	jst
M_DIN	mini-din connector,svhs	amp
MAINS	mains connector,din norm,3 pins	feller,schaffner
MAS	wire to board connector,pcm5,08	panduit
MCARD	memory card connector	itt,cannon
MELOK	metalok bantam connector	burndy
MKF	conn. for sil cable 2,54	stocko
MKFL	conn. for sil cable 2,54,friction lock	stocko
MKS	conn. for deflection yoke 30ax	stocko
MM	mini-match	amp

MMH	mini-mate	burndy
MOD1	modulair system, single raw	amp
MOD2	modulair system,double raw	amp
MOLEX	kind of single leaf (amp)	molex
MPF	wire to board conn pcm3,81/5,08/7,62	stocko
MR	miniature rectangular connector	amp
MT	mass termination system	amp
MTEDGE	mass termination,edge (on pcb)	amp
MT_FL	mass termination -friction lock	amp
ОВ	round connector	lemo
OXLEY	clip-in pcb and wire connector	oxley
PERI	video,rgb,audio connector	esser,preh,metallo
PHONE	jack connector 2,5/3,5/6,3	smk,
PIN		
REC	receptable	amp
RING	ring terminal	amp,givatec
ROUND	din connector,pins 3/4/5/6/7/8	hirschman,vogt,preh
RTT	telephone connector	rtt
RTV	radio tv connector	amp
SCREW	mounted on pcb	
SIL	single in line connector	amp
SL	single leaf connector	amp
SMB	coax connector	suhner;radial
SP	connector for focus yoke	smk
SPADE	spade terminal	amp,givatec,
SPADEI	spade terminal insulated	amp,givatec,
SV	wire to board connector,pitch 5mm	jst
TAB		amp,vogt
TM	trio mate connector	amp
TUBE	receiver tube	
U 0 . 3	U socket,raw spacing 0.3	amp,burndy
U 0 . 6	U socket,raw spacing 0.6	amp,burndy
UBAT	U socket with battery	
UINT	U interface connector,	
ULTREX	wire to board connector pcm 5/7,5	amp
UMNL	universal mate-in-lock	amp
UTG	round connector	burndy,vero
V	wire to board conn,pitch 7,5 & 5mm	jst
VHR	wire to board connector pcm3,96	jst
XLR	speaker or mains connector	cannon,binder,
ZG20	coax connector	wisi

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_					_			-	+	-	+	+	+	+	+	H		+			С		 typical application on printed circuit board
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RIT	ReeL tapped
REV	REVerse system, all plugs are sockets
SCFREWL	screwlock
SEAL	
SEL	mains selector
S FU PMF	
SENSOR	
SEV	swiss electrotechnical committee
SHLD	SHieLD
S	Short
SIL	single in line
SLV	
SN	tin plating
SOC	SOCket
SPG	
SPR	
SPMF	power mains filter with switch
SQUARE	form
STER	stereo
SW	SWitch
TAB	termination is a tab pin
TABX,X	terminal layout
TAG	solder terminal
TEST	testpoint
TRF	transformer
TUL	tulip ,typical form of a contact
UL	underwriters laboratories
VHFUHF	
WSHR	WaSHeR
WHI	white
WRAP	wrapping pins
YEL	yellow
ZFIX	connector pcb fix in Z form

Code	Resistor Tolerance	Color
	+/- 0,05 %	Cware
A B	+/- 0,05 % +/- 0,10 %	Grey Violet
C	+/- 0,10 %	Blue
D	+/- 0,50 %	Green
F	+/- 0,50 %	Brown
G	+/- 2 %	Red
Н	+/- 2,50 %	Neu
J	+/- 5 %	Gold
ĸ	+/- 10 %	Silver
L	+/- 15 %	Silvei
M	+/- 20 %	Without
М	7/ 20 6	Wichode
Code	Capacitance Tolera	nce
	≥ 10 pF	< 10 pF
В	+/- 0,10 %	+/- 0,10 pF
C	+/- 0,25 %	+/- 0,25 pF
D	+/- 0,50 %	+/- 0,50 pF
F	+/- 1 %	+/- 1 pF
G	+/- 2 %	+/- 2 pF
H	+/- 2,50 %	
J	+/- 5 %	
K	+/- 10 %	i
L	+/- 15 %	
M	+/- 20 %	
N	+/- 30 %	
P	+ 100% / - 0 %	
Q	+ 30% / - 10 %	
R	+ 30% / - 20 %	
S	+ 50% / - 20 %	
T	+ 50% / - 10 %	
Ū	+ 80% / - 20 %	
V	+ 100% / - 10 %	
W	+ 20% / - 0 %	
Y	+ 50% / - 0 %	
Z	+ 80% / - 20 %	

2.1 RGB BOARD

General.

The RGB board amplifies the RGB signals, processes the sync pulses and provides AKB (Automatic Kinescope Biasing). AKB ensures long-term stability of the black level in RGB signals, which guarantees stable contrast ratio for each colour and accurate colours, even at low intensity.

The module offers loopthrough for RGB; sync on green, composite sync or H & V sync.; sync. polarity is selected automatically. Picture controls are DC controlled.

On the RGB main module three SMD submodules are mounted:

- differential input (U1), for RGB and sync signals
- AKB (U12)
- Sync & Scaling (U5)

Optional RGB board versions are described in section 2.1.8 Customized Versions (Options)

2.1.1 IOPC DIAGRAM

MPRD 9600 RGB AMPLIFIER board 🛆

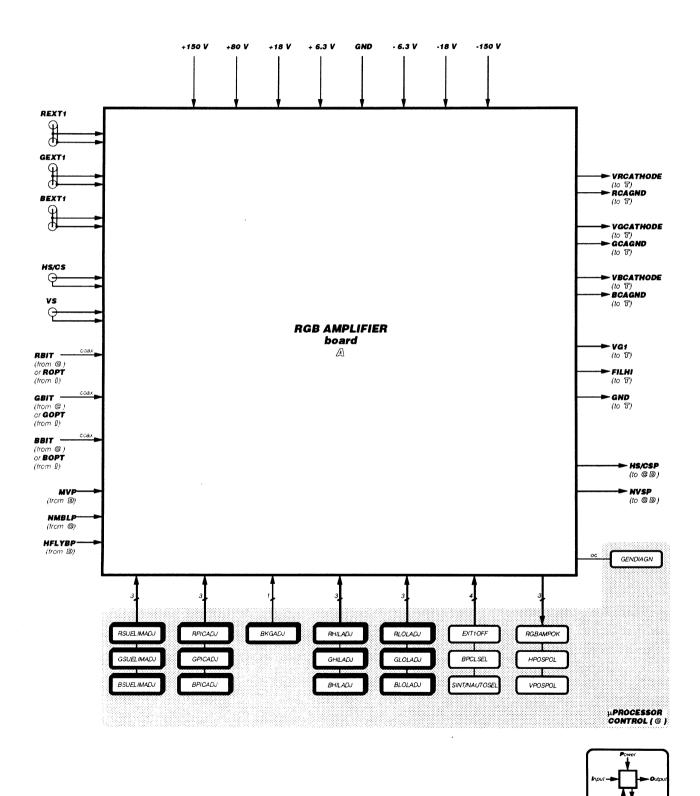


figure 2.1: RGB board IOPC diagram

2.1.2 BLOCK DIAGRAM

MPRD 9600 RGB AMPLIFIER A

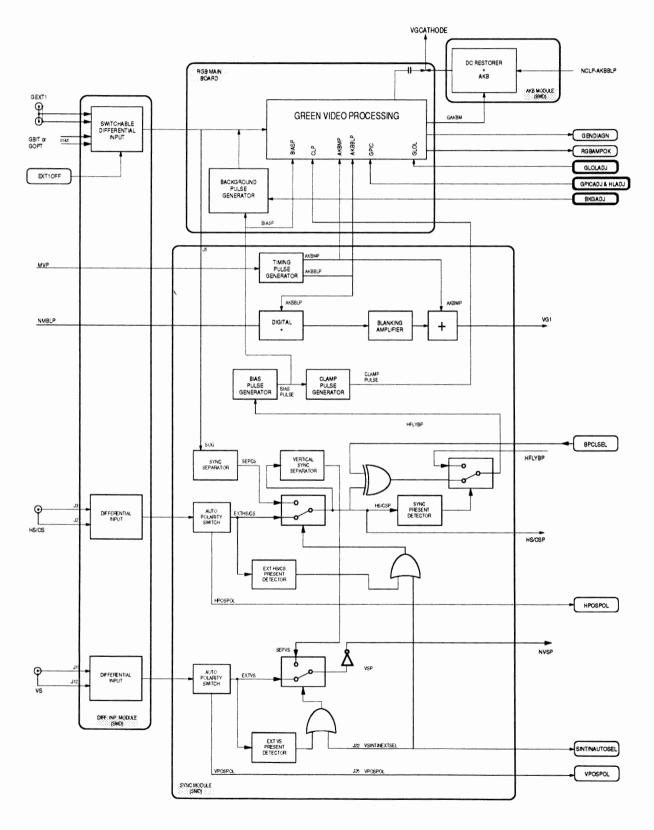


figure 2.2: RGB board block diagram

2.1.3 CIRCUIT DESCRIPTION

RGB MAIN MODULE.

RGB, SYNC Inputs (RGB main module, sheet 2 of 8)

The RGB inputs (J1,J5,J8) offer loopthrough facilities (J2,J6,J9), as an option the outgoing RGB connectors can be auto terminating the RGB output connections with R4,5,6. If not, the loopthrough connectors must be terminated externally in 75 Ω .

Horizontal Sync/Composite Sync Input (HS/CS) is connected via J11, Vertical Sync Input (VS) or CS Output is connected via J12, in case of CS it can be auto terminated with R8 (option).

J4,J7,J10 receive RGB from BIT, they are terminated in 75Ω ; if an optional second RGB input is installed, these plugs will receive the outputsignal of the second RGB input board, via the optional RGB input board BIT can be selected. J4,J7,J10 use sync on green.

As the RGB circuits are identical, only the G part will be explained.

The G signal is capacitively coupled to the differential input amplifier by C8,C9.

Amplifiers.

The schematic diagram, shown on RGB main module: AMPLIFIERS (sheet 1 of 3), contains components that are not used in MPRD9600 applications.

List of not mounted components: U2,3,4,U18

R9,10,11,12,14,16,17,18,19,20,21,22,23,24,25,26,27,31,32,33,43,46,49 C22,23,24,25,26,27,28,29,30,32,33,34,35,36,37,38,40,41,42,44,46,48,50,51,52,122,123

GICONHI, coming from the differential input, is connected to U8 via C45; DC bias to the video input is through R29. The low frequency roll-off of the amplifier in U8 is set by these two components; R97 extends the black level clamp range. The gain of the amplifier (= contrast) is controlled by GHILADJ*. R45 extends the high frequency gain of the video amplifier by compensating for some of the internal high frequency roll off, it allows to trim the gain of this channel to correct for differences in the three CRT cathodes. C66,C70 prevent noise entering the IC, C56 is a clamp capacitor, C62 is the contrast capacitor, R36,C57,71 reduce the noise on the +12V, R39,40 determine the clamp level (0.52V = black). R51 feeds the video outputsignal back to the inverting clampinput. The black level is shifted down 3.9V by D2, R60 is connected to the -5V to increase the outputswing (U14,pin1 = -3V for black); the outputsignal (U8,pin8) is connected to Q2 via U9,pin12,14 and R56.

The videosignal enters at U14,pin1 and leaves at pin 8, U14 drives the green cathode, coupled via C105 (and a series resitor on the CRT socket board). L8,C102 filters the +80V, D28,31 are protection diodes, C93,94 filter -/+5V. Shortly after vertical retrace, AKBBLP will be high, U9,pin13,14 will be closed, the base of Q2 is connected to GLOLADJ* (buffered by C129) for AKB-measurement (see also description AKB,U12).

Power and Blanking (RGB main module, sheet 3 of 8)

Q9,10,11 can switch g1 to -75.0 or +5V.

The -150V is reduced to -75V via D19, R94 and D20, C117 is a smoothing capacitor, D14,17 are protection diodes. D19 blocks current going back to the power supply.

During scanning (AKB disabled, NAKBMP = 1; Q11 on), the blanking is controlled by NMBLP-AKBBLP (hor., vert. and other purpose blanking); if NMBLP-AKBBLP goes low (=blanking required), Q8 will go off, Q7 will go on, charging C113 via R91 will open Q10, charging C112 via R90 will close Q9, g1 is connected to -75V. When NMBLP-AKBBLP goes high (= no blanking required), Q8 goes on, Q7 goes off, discharging C113 via R91 will close Q10, discharging C112 via R90 will open Q9, g1 is connected to 0V.

During AKB, beamcurrent is required and blanking must be disabled. NMBLP-AKBBLP will remain high because AKBBLP is high, g1 is connected to 0V. When NAKBMP goes low, Q11 will go off and g1 is connected to +5V.

DIFFERENTIAL INPUTS (U1) (RGB submodule (U1), sheet 4 of 8, 5 of 8)

RGB Inputs

The differential input amplifier for green has additional circuitry for SOG, the green channel will be described.

The RGB have double differential inputs, G1HI,G1LO and G2HI,G2LO.

G1HI,G1LO receive the external inputsignals, via the connectors J1,5,8 on the rear panel (=INP1). G2HI,G2LO receive the internal signal from BIT or from the optional second input module (INP2).

The inputsignal is capacitively coupled to G1HI, G1LO, R94,116 bias for the bases of Q25,26.

The temperature compensated constant current source Q2,D12, is connected to Q9,10. Only one of both (Q9,10) can be on, depending on the level of GEXT1OFF

When GEXT1OFF is high, Q22 will be saturated, the collectorcurrent goes through D10, R52,53, the cathode of D10 will be at -7,3V and the b-e junction of Q9 will conduct. As Q22 is saturated there will be 0,7V on the collector, the base of Q24 will be at 0,4V, Q24 is off, the voltage drop over R56 is 0V and the b-e junction of Q10 is biased in reverse direction, Q10 is off and so are Q25,26.

The current source is connected to R30,32 via Q9; G2HI,G2LO is selected. As the base of Q9 is on a fixed potential, the emittervoltage of Q9 and the collectorvoltage of Q2 will not change; Q2 will not be modulated when Q20,21 are driven with a common mode signal, increasing the common mode rejection. The amplification is determined by R30,32; R31,C14 increase the amplification in the high frequency range; R78,86 increase the stability. Only part of the current through R10 goes through Q20, the other part goes through Q23. The base of Q23 is forced to a fixed potential by R54,55, D17,49, and so is the emittor; the current through R10 will be constant as well. Only part of the current through R9 goes through Q21, the other part goes through Q8. The base of Q8 is forced to a fixed potential by R54,55, D17,49, and so is the emittor; the current through R9 will be constant as well. This means that the differential amplifier Q20,21 is fed by a constant current and voltage, eliminating feedback, increasing high frequency stability by lowering the influence of the Miller capacitor.

The voltage differences at the input of the differential amplifier are converted into a current difference through Q23. The collectorcurrent of Q23 is converted into a voltage by R113, and buffered by Q39, an emitterfollower with low outputing pedance (not very sensitive to capacitive loads); D36 ensures temperature stabilisation for Q39. The outputsignal is present across R112.

Sync on green

The collectorcurrent of Q8 is converted into a voltage by R51, and inverted by Q41 because the other side of the differential amplifier was taken as signalsource; D32 ensures temperature stabilisation for Q41. The output signal is present across R108.

Protection circuits

D33,34,37,38 limit the inputvoltages on the bases of Q20,21,25,26; R110,115,129,132 limit the current through th diodes during flash.

C37,39, connected to the GxLO inputs, shorts undesired high frequency components.

Brightness

GSUELIMP is synchronised with the hor, defl. and has a variable pulse-amplitude.

During backporch (or synctip) the pulse goes to the analog level (positive or negative, determined by the brightness setting). The pulse forces a current through R 109, as the voltage over R 10 is kept constant, the current will go through Q23 and is found back over R 121 and amplified by Q40. On the RGB board, the level of this additional pulse will be the reference for clamping, the videosignal will be dc-shifted by the amplitude of the GSUELIMP (=brightness control).

Sync Inputs

The horizontal or combined sync signal is connected to the HS/CSLO, HS/CSHI input, the vertical sync signal is connected to the VSLO, VSHI input.

HS/CSLO,HS/CSHI receive the syncsignal via connector J11 on the rear panel, VSLO,VSHI receive the syncsignal via the connector J12 on the rear panel. As both differential amplifiers are identical, only the HS/CS channel will be described.

Q5.D4,R2,22 is a temperature compensated constant current source. The bases of Q36,37 are DC-biased by R83,71; the amplification is determined by R72,74; D5.6,20,25 are protection diodes; R98,99 limit the current through the protectiondiodes during flash; C28 shorts undesired HF-components on HS/CSLO to ground, the outputsignal is capacitively coupled via C26

AKB (U12) (RGB main module: AMPLIFIERS sheet 1 of 8 and RGB submodule (U12), sheet 6 of 8)

During AKB measurement, the cathode is forced close to cut-off, g1 of the CRT is switched from 0 to \pm 5V, this wil result in a very small cathode current. This current is sensed by R76 (during normal scan, the voltage over R76 is limited to 2.8V by D5). The cathode clamp voltage will be regulated to obtain a cathode current of approximately 1μ A.

The outputstage of U14 is a class AB push-pull amplifier with additional buffering, during the measurement of the current through R76 the bias current in the outputstage must not interfere with the supplementary AKB current. For this reason, the input of the internal buffer in U14 will be short-circuited (via U14,pin6), the outputstage will be insulated from the buffer and will not interfere.

U14,pin6 is driven by GAKBBLP, via Q5 and R74.

The signal across R76 is amplified by U4 (2 stages), the signal leaves at U4,pin7. During AKBBLP = 1, U3,pin14,13 will be closed, the amplified pulse is coupled capacitively via C16 to U3,pin15. During AKB measurement U3, pin15,1 will close, the signal enters a sample and hold circuit (C7,R6,U4,pin8,9,10).

If GAKBM pulses are present, U4,pin8 will be positive, C5 is charged via R5.

The voltage across C5 drives the clamp voltage regulator (U4,pin12,13,14,R7,16,55,83,C99,D24,Q8). If the voltage across C5 rises, U14,pin4 will go less positive, Uce of Q8 will rise. The sum of the voltages across R55,Uce Q8 and D24 equals the clamp voltage (= UC100). This means that if the amplitude of the AKB measuring pulses rises, the clampvoltage will rise as well; the CRT is driven closer to cut-off and the amplitude of the AKB measuring pulses will decrease.

If no GAKBM pulses are present, or if their level is too low:

- U8,pin4 will not exceed U8,pin5 (approx. 50 mV),
- U8,pin12 will go low, led D6 will light,
- via D5 GENDIAGN goes low, via D4 RGBAMPOK goes low,
- the input voltage (U4,pin13) of the clamp voltage regulator wil decrease, U4,pin14 will go more positive, Vce of Q8 will drop and so will the clampvoltage,
- -as soon as the voltage across C100 drops below a certain level, the Schmitt Trigger (U8,pin7,9,10,R27,49,67,68, 70,52) will be activated, the output pin7 goes high, via D12 U4,pin14 goes high, U4,pin14 goes lower and Vce of Q8 will increase. The voltage across C100 will rise, exceeding a certain level forcing U8,pin7 to go low again. As soon as AKB measuring pulses are present again they will regulate and stabilise the clamp voltage.

The DC-restauration (=clamping) must be disabled during AKB, for this purpose GNCLP-AKBBLP is used as trigger for clamping. When GNCLP-AKBBLP goes low (clamping required) C23 will be charged via R71, Q2 will be on, Q9 will be off. The current, powered by the +150V goes through R33, Q2, C31 (turning on Q7 for a short moment); the cathode is forced to the clamp voltage. When GNCLP-AKBBLP goes high, C23 will be discharged, Q2 goes off, Q9 goes on, Q7 goes off. During clamping D25,26 will conduct, during active video D25,26 will be off and the cathode is insulated from the clamp circuit.

SYNC & SCALING (U5)

Scaling (RGB sub module: SYNC & SCALING: SCALING sheet 8 of 8)

The signals iPICADJ, iHILADJ, iLOLADJ, iSUELIMADJ are generated on the processorboard; the are rescaled according to the needs of the RGB board.

Sync (RGB sub module: SYNC & SCALING: SYNC sheet 7 of 8)

SOG (Sync on green)

SOG, coming from the differential input amplifiers, is buffered by Q2; DC-restored (R19,29,C1) and clamped C12,D3. Q3 amplifies approximately 6 times to increase noise immunity; the collectorsignal is clamped by C16,D4, R101 stabilizes the current through D4 to reduce sync phase jitter. The output of comparator U1,pin12 is only driven by the sync pulses and connected to the switch input line U8,pin1 (Y1B).

HS/CSICON

U1,pin7,9,10 is a pulseshaper to reduce the risetime of HS/CSICON, followed by an autopolarizing circuit U10,pin4,5,6,R69,C26. Independent from the sync polarity U10,pin6 will deliver positive sync ouput. Negative sync polarity will charge C26, U10 will invert the signal on pin5; positive sync will not charge C26, U10 will buffer the signal on pin5. U10,pin6 is followed by an 'external sync present detector' R67,75,D18,C30; the signal is inverted by U9,pin1,2 and connected via D5 to the switch control line U8,pin10 (SB). U10,pin6 is also connected to the switch input line U8,pin2 (Y0B)

If U8,pin10 is low (= external sync present) U8,pin2 (external sync) wil be connected with U8,pin15, U8,pin10 is high (= external sync NOT present) U8,pin2 (SOG) will be connected with U8,pin15.

U8,pin15 (=ZB) is connected to inverter U9,pin5,6 (output NHS/CSP on J12) followed by a sync present detector R6,8.10,C5.6,D10,11,Q1(= invertor) connected to the switch control line U8,pin9 (SC). U8,pin15 is also connected to U10,pin2; depending on the level of BPCLSEL the U10,pin1,2,3 will act as an inverter or a buffer. U10,pin3 is connected to switch input line U8,pin5 (Y0C). If U8,pin9 is low (= no internal sync (SOG) and no external sync present) HFLYBP will be used as a substitute (deflection is active even if no sync is present). U9,pin6 also drives the vertical sync seperator R9,22,34,36,C15,31,D9,15,U10. The seperated vertical sync pulses are connected to switch input line U8,pin13 (Y1A).

VSICON

U7,pin2,3,7 is a pulseshaper to reduce the risetime of VS, followed by an autopolarizing circuit U10,11,12,13, R5,C3. Independent from the sync polarity U10,pin11 will deliver positive sync output. Negative sync polarity will charge C3, U10 will invert the signal on pin12; positive sync will not charge C3, U10 will buffer the signal on pin12. U10,pin11 is followed by an 'external sync present detector' R33,68,74,C25,Q4; the signal is inverted by U9,pin8,9 and connected via D8 to the switch control line U8,pin11 (SA). U10,pin11 is also connected to the switch input line U8,pin12 (Y0A). If U8,pin11 is low, U8,pin14 will be connected to U8,pin12 and the vertical sync pulses VSICON will be used, if U8,pin11 is high, U8,pin14 will be connected to U8,pin13 and the seperated vertical sync pulses VSICON will be used.

The signal at U8,pin14 triggers a monostable U2,pin1,2,3,13,14,15,R35,C18, output pin13 drives another monostable U2,pin5,6,7,9,10,11,12,R11,C7; at pin5 leaves VSP, at pin 12 NVSP.

The signal at U8,pin4 triggers monostable U12,pin1,2,3,4,13,14,15,R70,C21; output U12,pin13 is the BIASP used for BACKGROUND adjust. U12,pin4 triggers monostable U12,pin5,6,7,8,9,10,11,R76,C33. U12,pin5 drives invertor U13,pin3, at U13,pin2 leaves NCLP, this pulse (starting later and ending before BIASP ends) times the clamping.

MVPEAKP triggers monostable U14,pin1,2,3,4,13,14,15,R40,C8; output U14,pin13 triggers monostable U14,pin5,6,7,9,10,11,12,R71,C34. U14,pin4 is delayed by R37,C11; the delayed signal and output U14,pin12 are ANDed by U3,pin8,9,10. U3,pin8 is connected to U3,pin4,5 via R12,C10,D12 (delaying only the rising edges). Output U14,pin12 is inverted by U13,pin9,10; the output u14,pin12 is inverted by U13,pin9,10; the output u14,pin12 is inverted by U3,pin4,5,6.

Output U3,pin6 is connected to inverters U11,pin9,10, U11,pin11,12 an U11,pin14,15; the (identical) output signals are RAKBBLP,GAKBBLP and BAKBBLP.

U3.pin1,2,3 ANDs CLP and NAKBBLP, output U3.pin3 is inverted by U11,pin2,3, U11,pin4,5 and U11,pin6,7; the outputsignals are RNCLP-AKBBLP, GNCLP-AKBBLP and BNCLP-AKBBLP.

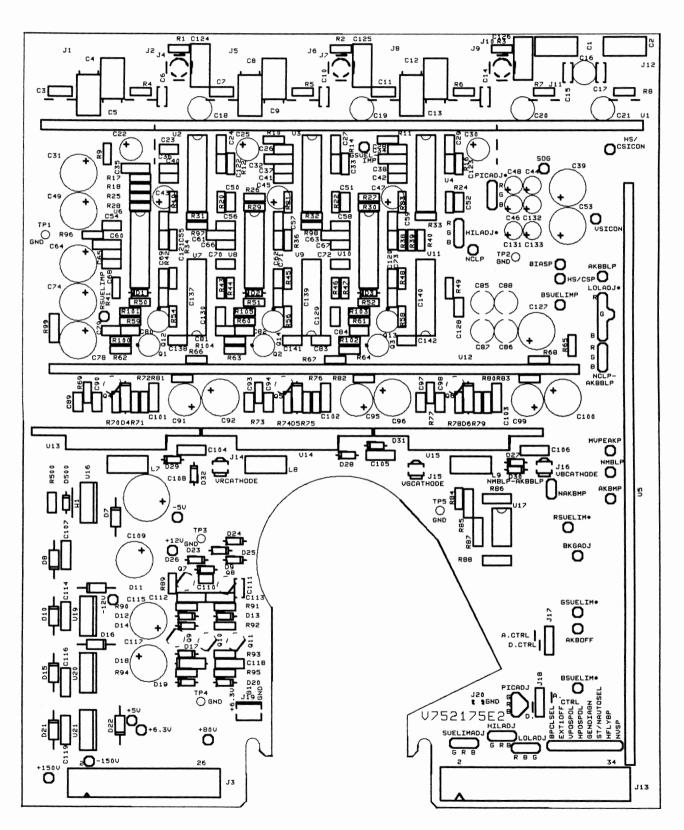
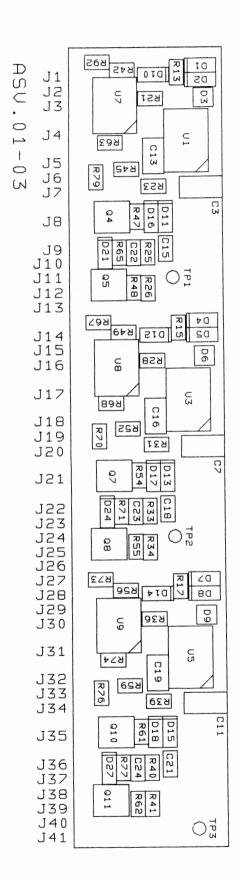


figure 2.3: RGB BOARD component side



C36 2 R93 R1 0 C1 1 R20 CS R43 Ω C25 0 RZZ C26 2 ₹ 7 8 1 1 1 1 1 1 1 S \mathbb{D} R46 R24 R2 D19 R3 C14 D20 C4 9 R66 R4 C27 90 R14 C28 R27 R5 C5 R29 R50 63 C29 R30 C30 2 85 R69 R53 R32 R6 DSS C17 R7 D23 CB 92 R72 R8 C31 6 R16 C35 R35 R9 C9 C10 R37 R57 C33 R38 C34 9 **R58** R75 R60 R1B R10 D25 R11 C20 D26 C12 R78 R12 C35 012 R19

figure 2.4: AKB SMD module component side

figure 2.5: AKB SMD module solder side

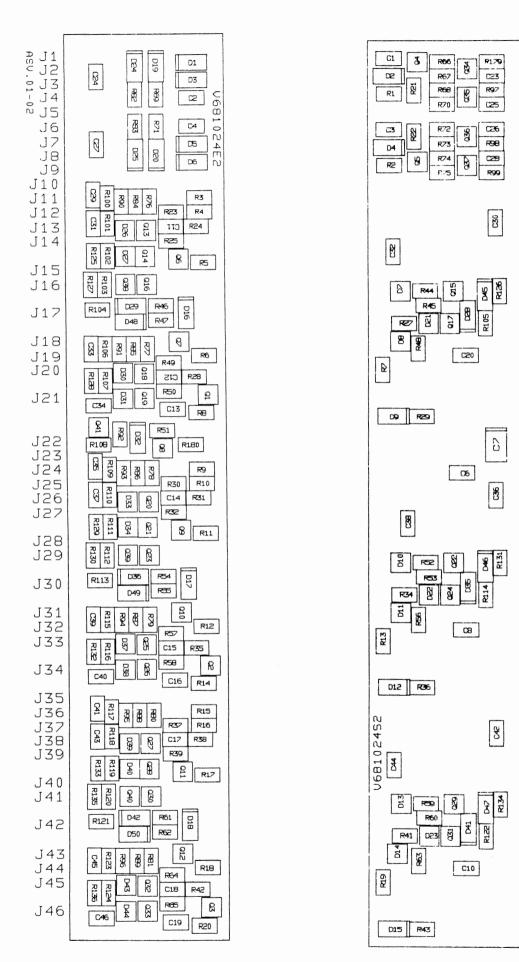
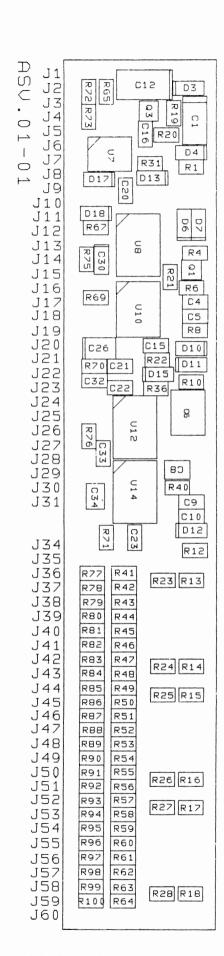


figure 2.6 : DIFF. INP. SMD module component side figure 2.7 : DIFF. INP. SMD module solder side

ASU.02-02



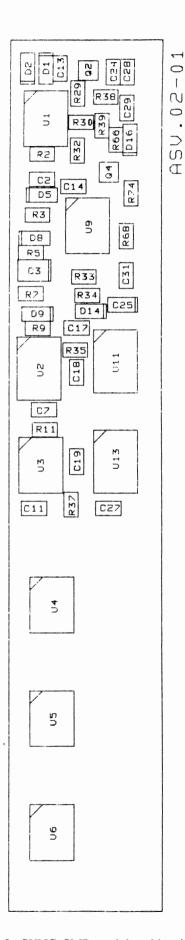


figure 2.8: SYNC. SMD module component side

figure 2.9: SYNC. SMD module solder side

2.1.5 PARTSLIST

Order number of a complete RGB BOARD BNC : V5631210 12 Date : 01/12/92

Order number	Do	agription	Thom
		scription	Item
V101500	R	MF H 1E F 0W4 E2	R93
V101512	R	MF H 10E F 0W4 E2	R84
V101516	R	MF H 22E F 0W4 E2	R100,R102,R104,R54 ,R56 ,R58
V101523	R	MF H 82E F 0W4 E2	R42
V1015231	R	MF H 75E F 0W4 E2	R1 ,R2 ,R3 ,R4 ,R5 ,R6 ,
TT1 0 1 E 0 4	_		R7 , R8
V101524	R	MF H100E F 0W4 E2	R45 , R48
V101527	R	MF H180E F 0W4 E2	R101,R103,R105,R62 ,R63 ,R64
V101528 V101529	R	MF H220E F 0W4 E2	R34 ,R36 ,R38
V101529 V101533	R R	MF H270E F 0W4 E2	R69 ,R73 ,R77
V101533 V101536	R	MF H560E F 0W4 E2 MF H 1K F 0W4 E2	R59 ,R60 ,R61 ,R99
V101536 V101537	R		R65 ,R89 ,R92
V101537 V101541	R		R40 R50 ,R51 ,R52
V101541 V101543	R	MF H 2K7 F 0W4 E2 MF H 3K9 F 0W4 E2	R72 ,R76 ,R80
V101548	R	MF H 10K F 0W4 E2	R28 ,R29 ,R30 ,R90
V101540 V101550	R	MF H 15K F 0W4 E2	R41 ,R44 ,R47
V101550 V101551	R	MF H 13K F 0W4 E2	R39 ,R96 ,R97 ,R98
V101551 V101555	R	MF H 39K F 0W4 E2	R71 ,R75 ,R79
V101556	R	MF H 47K F 0W4 E2	R70 ,R74 ,R78 ,R94
V101557	R	MF H 56K F 0W4 E2	R66 ,R67 ,R68
V101560	R	MF H100K F 0W4 E2	R91 ,R95
V101572	R	MF H 1M F 0W4 E2	R81 ,R82 ,R83
V1026007	R	MF H 10K F 0W6	R85
V1026357	R	MF H 23K2 F 0W6	R87
V1026467	R	MF H 30K1 F 0W6	R88
V1026517	R	MF H 34K F 0W6	R86
C1113889	С	EL RA 47M M100E2 85	C117
V1114165	С	EL RA 10M M200E2 105	C100,C127,C92 ,C96
V1114689	С	EL RA 470M M 16E2 105	C53 ,C74 ,C78
V111478	С	EL RA 220M M 25E2 105	C109,C31 ,C39 ,C49 ,C64
V111484	С	EL RA 100M M100E2 105	C108
V1114942	С	EL RA 10M M 50E1 105	C131,C132,C133
V1114969	C	EL RA 47M M 63E2 105	C115
V1115319	C	EL RA 10M M 50E2 105	C43 ,C45 ,C47
V1115657	C	EL RA 1M M200E1 105	C91 ,C95 ,C99
V111679	C	EL BRA 10M M 25E2 85	C1 ,C12 ,C124,C125,C126,C13 ,
			C16 ,C18 ,C19 ,C2 ,C20 ,C21 ,
			C4 ,C5 ,C8 ,C85 ,C86 ,C87 ,
			C88 ,C9
V112232		NP0 MI 15P G 63E2	C11 ,C3 ,C7
V1127030	C	X7R MU 100N K200E2 125	C101,C102,C103,C104,C105,C106,
171107500	_	WED 197 03707 5070 405	C112,C113,C118
V1127500	C	X7R MU 8N2K 50E2 125	C110
V1127830	C	X7R MU 100N K 50E2 125	C111
V1127870	С	X7R MU 330N K 50E2 125	C107, C114, C116, C119
V1127930	C	X7R MU 1M K 50E2 125	C60 ,C61 ,C63
V1127990	С	X7R MU 100N K100E2 125	C120,C121,C128,C129,C130,C137,
			C138,C139,C140,C141,C142,C54 ,
			C55 ,C56 ,C57 ,C58 ,C59 ,C62 ,
			C65 ,C66 ,C67 ,C68 ,C69 ,C70 ,
			C71 ,C72 ,C73 ,C79 ,C80 ,C81 , C82 ,C83 ,C84 ,C89 ,C90 ,C93 ,
			C94 ,C97 ,C98
			C34 , C3/ , C30

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Order number Description
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                                            C10 ,C14 ,C143,C144,C145,C15 ,
                                            C17 ,C6
                                            D23 ,D24 ,D25 ,D26
V1316211
              D 1N4148
                               SW DO35
                                            D14 ,D17 ,D19 ,D27 ,D28 ,D29 ,
V131627
              D BAV21
                               SW DO35
                                            D30 ,D31 ,D32
C131646
              D 1N4007
                                R D041
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V131712
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                               C D07
                                            D18 , D4
              D ZEN
                                                     , D5
                                                           , D6
C131720
              D ZEN
                       6V2 0W5
                                C D035
                                            D9
V131752
              D ZEN
                      75V
                           0W5
                                C D035
                                            D20
V131754
                                C D035
              D ZEN
                       3V3 0W5
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                                                , D2
                                                      , D3
V131758
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                     15V
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V132597
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                                                , Q5
                                            04
                                                     ,Q6 ,Q9
V132618
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                            FN SS T092
V132624
              Q BSS92
                            FP SS TO92
                                            010
                                            Q11 ,Q8
V132631
              Q BSS98
                            FN SS TO92
                            FP SS TO92
                                            Q7
V132632
              Q BSS110
              Q ACC WSHR
                                            0060,0120
V133076
                                  T05
V133082
              Q ACC INSUL BUSH
                                  TO220
                                            0033,0043
V1340022
              U 7812
                                TO220 P
                                            U19
              U 2990-12 LM
V1340162
                                TO220 M
                                            U20
V1340281
              U 2990-5 LM
                                TO220 M
                                            U16
V134044
              U 2940-5 LM
                                TO220 P
                                            U21
                                                      ,U8
V134137
              U 1201
                         LM
                                DIP16 P
                                            U10 ,U6
              U 062I
                                            U17
V1341431
                         TI.
                                DIP8
                                       Ι
                                            U11 ,U7
V137537
              U 74HCT4053
                                DIP16
                                       Ρ
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C302108
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                                            L7 ,L8
V306100
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V3131400
              J BNC
                      FCT P 1 50E
                                            0072
V313202
              J SMB
                      MBT P 1 50E
                                            J10 ,J4
                                                      ,J7
V3133691
              J BNC
                      ACC WHSR
                                            0073
                       JMP P 1 E1AU
                                            0800
V313392
              J MD
V313393
              J MD1
                      MBT P 3 E1AU
                                            J17 ,J18
              J FLT2 MBT P26 E1AU
V313470
                                            J3
V313472
              J FLT2 MBT P34 E1AU
                                            J13
              J DUBX1 MBT P 2 E1AU
V3139132
                                            J14 ,J15 ,J16
V3139134
              J DUBX1 MBT P 3 E1AU
                                            J19
V315310
              J TAB1 MBT H 2.8S0.5
                                            0140
              J TAB1 MBT H 2.8S0.8
                                            TP5
V3153108
V345015
              WIRE 1.0 MM CU SN
                                       Y
                                            0074
V346993
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                                            0150
              SLE SHR 6.0 3:1 BLA
C347053
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V3481024
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                                            D500
C3481042
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                                            0110
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V3481118
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                                     ISO
                                            0111
V349637
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                                            0037
V3620216
              SMP-I AM3 X 6 D 84
                                            0032,0042,0101
V3620226
              SMP-I AM3 X 8 D 84
                                            0035
                                            0034,0044,0102
V3673906
              WASHER CRINKLE I M3
V3685506
              STANDOFF M3-14 INOX
                                            0100
V603593
              RGB INPUT BNC
                                      01
                                            0070
V603643
              HEATSINK HYBRIDE
                                      01
                                            0030
V603644
              HEATSINK RGB POWER
                                      01
                                            0040
V603646
              SMD STEUN
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                                            0050
V603649
              SOLDERLUG RGB
                                      02
                                            0071
V603693
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V603694
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                                 RGB
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                                            U1
V681025
              SMD AKBMOD MPRD9600 $$$03
                                            U12
V681026
              SMD SYNC.MOD. MPRD9600 04
                                            115
V715895
              HYBRIDE RGB MPRD 9000 00
                                            U13 ,U14 ,U15
V716543
              PCB TESTPOINT
                                      05
                                            TP1 , TP2 , TP3 , TP4
              SMC SCREW ISOL.3.4-5.1 00
V7508573
                                            0036
V752175
              PCB RGB AMPL.
                                9000 01
                                            0010
Order number of a SMD DIF. INPUT: V681024
                                           DATE : 01/12/92
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P200033
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P200043
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                           J 0W12 1206
                                            R127, R130, R135
              R# CE H100E J 0W12 1206
P200049
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                                            R136,R19 ,R46 ,R54 ,R61 ,R7
P200053
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P200055
              R# CE H180E J 0W12 1206
                                            R66 ,R68 ,R72 ,R74
P200057
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P200065
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P200071
              R# CE H820E J 0W12 1206
                                            R1 , R2
P200073
              R# CE H 1K J 0W12 1206
                                            R126,R131,R134,R29 ,R36 ,R43 ,
                                            R47 , R55 , R62
              R# CE H 1K2 J 0W12 1206
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P200075
              R# CE H
                                            R21 ,R22
P200079
                       1K8 J 0W12 1206
P200091
              R# CE H
                        5K6 J 0W12 1206
                                            R100, R109, R117
P200093
              R# CE H 6K8 J 0W12 1206
                                            R105,R114,R122,R14,R20,R45,
                                            R53 , R60 , R8
P200095
              R# CE H 8K2 J 0W12 1206
                                            R24 ,R28 ,R31 ,R35 ,R38 ,R42
              R# CE H 22K J 0W12 1206
P200105
                                            R102, R107, R111, R116, R119, R124,
                                            R69 ,R71 ,R82 ,R83 ,R90 ,R91 ,
                                            R93 , R94 , R95 , R96
                                            R27 ,R34 ,R41
P200121
              R# CE H100K J 0W12 1206
                                            R44 ,R48 ,R52 ,R56 ,R59 ,R63
P200129
              R# CE H220K
                           J 0W12 1206
P200381
              R# CE H 56E F 0W12 1206
                                            R76 ,R77 ,R78 ,R79 ,R80 ,R81 ,
                                            R84 ,R85 ,R86 ,R87 ,R88 ,R89
P200387
              R# CE H100E F 0W12 1206
                                            R23 ,R25 ,R30 ,R32 ,R37 ,R39 ,
                                            R49 ,R50 ,R57 ,R58 ,R64 ,R65
P200399
              R# CE H330E F 0W12 1206
                                            R10 ,R15 ,R16 ,R3 ,R4 ,R9
                                            C11 ,C12 ,C14 ,C15 ,C17 ,C18
P210013
              C(S)CEC1CH1206COG102J 50
P210122
              C(S)CEC2CH1206X7R104K 50
                                            C1 ,C10 ,C13 ,C16 ,C19 ,C2
                                            C20 ,C24 ,C25 ,C26 ,C27 ,C29
                                            C3 ,C30 ,C32 ,C34 ,C35 ,C36 ,
                                            C38 ,C4 ,C40 ,C41 ,C42 ,C44 ,
                                            C46 ,C6 ,C8
P210152
              C(S)CEC2CH1206X7R153K 50
                                            C23 ,C28 ,C31 ,C33 ,C37 ,C39 ,
                                            C43 ,C45
P212006
              C(S) TACH3528
                                475M 16
                                            C7
P232004
              SMC(S)TRA
                               BC849C
                                            Q1
                                                ,Q10 ,Q11 ,Q12 ,Q2
                                                                     , Q3
                                                , Q7
                                                      , Q9
                                            06
                                                , Q5
P232051
              SMC(S)TRA
                               BC847B
                                            Q4
P232069
              SMC(S)TRA
                               BT2369
                                            Q34 ,Q35 ,Q36 ,Q37
P232090
              SMC(S)TRBB BFR92A
                                            Q13 ,Q14 ,Q18 ,Q19 ,Q20 ,Q21 ,
                                   SOT23
                                            Q25 ,Q26 ,Q27 ,Q28 ,Q32 ,Q33 ,
```

SOT23

SMC(S)TRBB BFT92

P232091

Q38 ,Q39 ,Q40 ,Q41

Q16 ,Q23 ,Q30 ,Q8

Order number	Description	Item
P232101	SMC(S)TRPNP BC859C SOT23	Q15 ,Q17 ,Q22 ,Q24 ,Q29 ,Q31
P234013	SMC(S)DIOZEN BZX84C4V7	D10 ,D11 ,D13 ,D14 ,D7 ,D8
P234018	SMC(S)DIOZEN BZV55C6V2	D48 ,D49 ,D50
P234047	SMC(S)DIO BAV99	D26 ,D27 ,D30 ,D31 ,D33 ,D34 ,
		D37 ,D38 ,D39 ,D40 ,D43 ,D44
P234055	SMC(S)DIO BAT54	D21 ,D22 ,D23
P234099	SMC(S)DIO 4148	D1 ,D12 ,D15 ,D16 ,D17 ,D18 ,
		D19 ,D20 ,D24 ,D25 ,D28 ,D29 ,
		D3 ,D32 ,D35 ,D36 ,D41 ,D42 ,
		D45 ,D46 ,D47 ,D5 ,D6 ,D9
P234127	SMC(S)DIZEN BZV55C5V1 DMM	D2 , D4
P313290	CONMOBTE	J
P900897	PRINT - P1323897	S

Order number of a complete AKB: V681025 Date: 01/12/92

Order number	Description	Item
P200025	R# CE H 10E J 0W12 1206	R25 ,R33 ,R40
P200041	R# CE H 47E J 0W12 1206	R12 ,R18 ,R24 ,R32 ,R4 ,R8
P200071	R# CE H820E J 0W12 1206	R13 ,R15 ,R17
P200073	R# CE H 1K J 0W12 1206	R48 ,R55 ,R62
P200085	R# CE H 3K3 J 0W12 1206	R66 ,R72 ,R78
P200087	R# CE H 3K9 J 0W12 1206	R11 ,R3 ,R7
P200089	R# CE H 4K7 J 0W12 1206	R21 ,R28 ,R36 ,R45 ,R52 ,R59
P200097	R# CE H 10K J 0W12 1206	R10 ,R2 ,R47 ,R54 ,R6 ,R61 ,
		R65 ,R71 ,R77
P200109	R# CE H 33K J 0W12 1206	R63 ,R68 ,R74
P200111	R# CE H 39K J 0W12 1206	R44 ,R51 ,R58
P200113	R# CE H 47K J 0W12 1206	R14 ,R16 ,R19
P200121	R# CE H100K J 0W12 1206	R1 ,R26 ,R34 ,R41 ,R5 ,R9
P200129	R# CE H220K J 0W12 1206	R42 ,R49 ,R56 ,R67 ,R73 ,R92
P200131	R# CE H270K J 0W12 1206	R43 ,R50 ,R57
P200137	R# CE H470K J 0W12 1206	R23 ,R31 ,R39
P200145	R# CE H 1M J 0W12 1206	R27 ,R35 ,R70 ,R76 ,R79 ,R93
	R# CE H 56K F 0W12 1206	R22 ,R30 ,R38 ,R64 ,R69 ,R75
P200465	R# CE H180K F 0W12 1206	R20 ,R29 ,R37 ,R46 ,R53 ,R60
P210013	C(S)CEC1CH1206COG102J 50	C1 ,C5 ,C9
P210122	C(S)CEC2CH1206X7R104K 50	C10 ,C12 ,C2 ,C25 ,C26 ,C28 ,
		C29 ,C30 ,C32 ,C33 ,C34 ,C36 ,
		C4 ,C6 ,C8
P210211	C(S)CEC2CH1206X7R472K 200	C15 ,C18 ,C21
P210212	C(S)CEC2CH2220X7R104K 200	C14 ,C17 ,C20
P210215	C(S)CEC1CH1206COG220J 200	C27 ,C31 ,C35
P210216	C(S)CEC2CH1206X7R222K 200	C22 ,C23 ,C24
P215017BVC	C POMEPO330NF K5 50V	C11 ,C3 ,C7
P215101	C(S)MKTFILM22NFJ25V C1812	C13 ,C16 ,C19
P230030	SMC(S)ICCMOS 4053	U1 ,U3 ,U5
P230061	SMC(S)ICLQUA TL074I	U2 ,U4 ,U6
P230488	SMC(S)ICCOM LM219 SO14	U7 ,U8 ,U9
P232062	SMC(S)TRA BF622	Q11 ,Q5 ,Q8
P232115	SMC(S)TRFET BSS131 SOT23	Q12 ,Q6 ,Q9
P232122	SMC(S)TRNPN BCX56 SOT89	Q10 ,Q4 ,Q7
P232128	SMC(S)TRFET BSS192 SOT89	Q1 ,Q2 ,Q3
P234040	SMC(S)DIOLED LSS260	D3 , D6 , D9

Order number	Description		Iter	n					
P234046	SMC(S)DIOZEN	BZV55C12	D11	,D13	,D15	,D16	,D17	,D18	
P234087	SMC(S)DIO	BAV102	D19	,D20	,D22	,D23	,D25	,D26	
P234099	SMC(S)DIO	4148	D1	,D10	,D12	,D14	, D2	,D4	,
			D5	, D7	, D8				
P234203	SMC(S)DIZENBZ	V55C51DMMELF	D21	,D24	,D27				
P242012BVC	PCB TESTPIN	/V7165 4 3	TP1	,TP2	,TP3				
P313290	CONMOBTE		J						
P900885	PRINT - P1319	885	S						

Order number of a complete SMD SYNC : V681026 Date : 01/12/92

Order number	Description	Item
P200041	R# CE H 47E J 0W12 1206	R22
P200049	R# CE H100E J 0W12 1206	R33 ,R67 ,R72
P200053	R# CE H150E J 0W12 1206	R20
P200069	R# CE H680E J 0W12 1206	R73
P200073	R# CE H 1K J 0W12 1206	R10 ,R2 ,R32 ,R37 ,R7
P200074	R# CE H 1K1 J 0W12 1206	R48 ,R56 ,R64
P200077	R# CE H 1K5 J 0W12 1206	R19
P200081	R# CE H 2K2 J 0W12 1206	R34 ,R38
P200089	R# CE H 4K7 J 0W12 1206	R21 ,R36 ,R5 ,R69
P200095	R# CE H 8K2 J 0W12 1206	R29
P200097	R# CE H 10K J 0W12 1206	R12 ,R30 ,R39 ,R9
P200105	R# CE H 22K J 0W12 1206	R11 ,R3 ,R4 ,R68 ,R75
P200109	R# CE H 33K J 0W12 1206	R35
P200111	R# CE H 39K J 0W12 1206	R65
P200113	R# CE H 47K J 0W12 1206	R6
P200118	R# CE H 75K J 0W12 1206	R13 ,R15 ,R17
P200131	R# CE H270K J 0W12 1206	R31
P200143	R# CE H820K J 0W12 1206	R66 ,R74 ,R8
P200145	R# CE H 1M J 0W12 1206	R101
P200363	R# CE H 10E F 0W12 1206	R77 ,R78 ,R79 ,R80 ,R85 ,R86 ,
		R87 ,R88 ,R93 ,R94 ,R95 ,R96
P200414	R# CE H 1K3 F 0W12 1206	R76
P200416	R# CE H 1K6 F 0W12 1206	R70
P200432	R# CE H 7K5 F 0W12 1206	R40 ,R71
P200435	R# CE H 10K F 0W12 1206	R41 ,R42 ,R43 ,R44 ,R49 ,R50 ,
		R51 ,R52 ,R57 ,R58 ,R59 ,R60
P200442	R# CE H 20K F 0W12 1206	R100,R14 ,R16 ,R18 ,R24 ,R26 ,
		R28 ,R46 ,R47 ,R54 ,R55 ,R62 ,
		R63 ,R81 ,R82 ,R83 ,R84 ,R89 ,
		R90 ,R91 ,R92 ,R97 ,R98 ,R99
P206419	R# CE H 23K2 F 0W12 1206	R45 ,R53 ,R61
P206435	R# CE H 34K F 0W12 1206	R23 ,R25 ,R27
P210045	C(S)CEC2CH1206X7R473K 50	C18
P210067	C(S)CEC2CH2321X7R105M 50	C6
P210076	C(S)CEC1CH1206COG221J 50	C11
P210092	C(S)CEC2CH1206X7R103K 50	C7
P210102	C(S)CEC1CH1206COG471J 50	C21 ,C33
P210121	C(S)CEC1CH1206COG331J 50	C10
P210122	C(S)CEC2CH1206X7R104K 50	C13 ,C14 ,C16 ,C17 ,C19 ,C2 ,
		C20 ,C22 ,C23 ,C24 ,C27 ,C28 ,
		C29 ,C32 ,C4 ,C5 ,C9
P210137	C(S)CEC1CH1206COG101J 50	C31

```
Order number Description
                                          Item
P210150
             C(S)CEC2CH1206X7R332K 50
                                          C15
P210154
             C(S)CEC1CH1210COG562J 50
                                          C34 ,C8
P212006
             C(S) TACH3528
                             475M 16
                                          C26 ,C3
             C(S) TACH3216
                                          C25 ,C30
P212009
                             105M 16
             C(S) TACH6032
P212018
                              106M 16
                                          C1
P212024
             C(S) TACH7343 106M 35
                                          C12
P230030
             SMC(S)ICCMOS
                              4053
                                          U8
P230103
                           74HCT04
                                          U9
             SMC(S)ICCMOS
P230328
              SMC(S)ICLQUA
                            TL064I
                                          U4 ,U5 ,U6
             SMC(S)ICHCT 74HCT08 SO14
                                          U3
P230422
              SMC(S)ICHCT 74HCT86 SO14
P230478
                                          U10
              SMC(S)ICHCT 74HCT221 SO16
P230479
                                          U12 ,U14 ,U2
P230488
              SMC(S)ICCOM LM219
                                  S014
                                          U1
P230580
             SMC(S)ICCOM LM211
                                  S08
                                          U7
P230617
             SMC(S)ICHC 74HC4049 S016
                                          U11 ,U13
P232004
             SMC(S)TRA
                             BC849C
                                          Q1
P232067
             SMC(S)TRA
                             BC857C
                                          Q2
P232069
             SMC(S)TRA
                             BT2369
                                          Q3
P232104
             SMC(S)TRNPN BC847C SOT23
                                          Q4
                                          D1 ,D10 ,D11 ,D12 ,D13 ,D14 ,
P234099
             SMC(S)DIO
                               4148
                                          D16 ,D17 ,D18 ,D2 ,D3 ,D5 ,
                                          D6 ,D7 ,D8
P234140
                                          D15 , D4 , D9
             SMC(S)DIOSCH
                             LL101A
P313290
             CONMOBTE
                                          J
P900901
             PRINT - P1335901
                                          S
```

2.1.6 SCHEMATIC DIAGRAM

2.1.7 BACKBOARD CONNECTIONS

RGB AMPLIFIER Board Connector J3 is connected with BACKBOARD Connector J3 by a 26 pins Flat Cable.

J3	signai		
pin nr	name	to	from
	+150 V	Т	P
1 4	+150 V		P
	nc/ntbu	.	5
	nc/ntbu		
1 4	-150 V	*********	P
	-150 V		P
1 2 3 4 5 6 7 8 9	nc/ntbu	l	
ا ا	nc/ntbu		
	+80 V (or +40 V)	100000000000000000000000000000000000000	P
10	+80 V (or +40 V)	1	P
11	nc/ntbu (or -40 V)	ł	(P)
12	nc/ntbu (or -40 V)		æ
13	GND	**********	P
14	GND		P
15	+6.3 V / A		P
16	+6.3 V / A		P
17	-18 V		P
18	-18 V		P
19	GND		P
20	GND		P
21	GND		P
21 22	GND		P
23	+18 V		P
24	+18 V		P
25	-6.3 V		P
26	-6.3 V		P

	[-tt		
J13 pin nr	signal name	to	from
P	Than 10		
1	RSUELIMADJ		G
2	GSUELIMADJ		G
2 3 4 5 6 7 8 9	BSUELIMADJ		G
4	GND		
5	RPICADJ		· · · · · · · · ·
9	GPICADJ		©
1 1	BPICADJ		G
8	GND		
9	RHILADJ		@
10	GHILADJ		G
11	BHILADJ		G
12	BKGADJ		©
13	GND		_ 1
14	RLOLADJ		G
15	GLOLADJ		©
16	BLOLADJ		©
17	GND		_ [
18	AKBOFF		G
19	EXT10FF		G
20	STCLSEL		G
21	HPOSPOL	G	
22	VPOSPOL	G	
23	RGBAMPOK	G	
24	GENDIAGN oc/int	G	DEILMO
25	SINT/NAUTOSEL		G
26	MVP		D
27	GND		
28	HFLYBP		D
29	GND		
30	NVSP	G D	
31	GND		
32	HS/CSP	GD .	
33	GND		
34	NMBLP		©

2.1.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

RGB BOARD WITH TRIAX CONNECTORS V5631212

Order number of a complete RGB BOARD TRIAX: V5631212 07 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TRIAX V5631212 07

NOT MOUNTED

Item

0071

0073

SUBSTITUTES

Order Number	Description	Item
V603593 V6035932	RGB INPUT BNC 01	0070 replaced by
V3131400 V313150	J BNC FCT P 1 50E	0072 replaced by
V3685506	J BNT P 1 50E STANDOFF M3-14 INOX	0100 replaced by
V3685496	STANDOFF M3-12 INOX	

RGB BOARD WITH TNC CONNECTORS INTERNALLY TERMINATED V5631213

Order number of a complete RGB BOARD TNC TERM: V5631213 07 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TNC TERM V5631213 07

SUBSTITUTES

Order Number	Description	Item
V603593	RGB INPUT BNC 01	0070 replaced by
V6035936	RGB INPUT TNC NLT 00	
V3131400	J BNC P 1 50E	0072 replaced by
V313117	J TNC FCT P 1 50E	

RGB BOARD WITH TNT CONNECTORS INTERNALLY TERMINATED V5631214

Order number of a complete RGB BOARD TNT TERM: V5631214 00 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM V5631214 00

NOT MOUNTED

Item 0071 0073

SUBSTITUTES

Order Number	Description	Item
V603593	RGB INPUT BNC 01	0070 replaced by
V6035934	RGB INPUT TNT 00	
V3131400	J BNC P 1 50E	0072 replaced by
V313152	J TNT FCT P 1 50E	

RGB BOARD WITH TROMP CONNECTORS INTERNALLY TERMINATED V5631217

Order number of a complete RGB BOARD TROMP: V5631217 04 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TROMP V5631217 04

NOT MOUNTED

SUBSTITUTES

Order Number	Description	Item	
V603593	RGB INPUT BNC 01	0070	replaced by
V6035932	RGB INPUT TRIAX 01		
V3131400	J BNC P 1 50E	0072	replaced by
V313155	J BNT FCT P 1 50E		
V3685506	STANDOFF M3-14 INOX	0100	replaced by
V3685496	STANDOFF M3-12 INOX		

RGB BOARD WITH BNC CONNECTORS FC722 COATING V5631910

Order number of a complete RGB BOARD BNC FC722 : V5631910 01 Date : 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD BNC FC722 V5631910 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD WITH TNC CONNECTORS INTERN. TERM. H.SEAL V5631913

Order number of a complete RGB BOARD TNC TERM HSEAL: V5631913 00 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TNC TERM HSEAL V5631913 00

SUBSTITUTES

Order Number	Description	Item
V603593	RGB INPUT BNC 01	0070 replaced by
V6035936	RGB INPUT TNC NLT 00	
V3131400	J BNC P 1 50E	0072 replaced by
V313117	J TNC FCT P 1 50E	

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0200

RGB BOARD WITH TNT CONNECTORS FC722 V5631914

Order number of a complete RGB BOARD TNT TERM: V5631914 00 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM V5631914 00

NOT MOUNTED

Item 0071 0073

SUBSTITUTES

Order Number	Description	Item
V603593	RGB INPUT BNC 01	0070 replaced by
V6035934	RGB INPUT TNT 00	
V3131400	J BNC P 1 50E	0072 replaced by
V313152	J TNT FCT P 1 50E	
ADDED		

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD WITH TNT CONNECTORS INTERNALLY TERMINATED FC722 V5631915

Order number of a complete RGB BOARD TNT TERM FC722: V5631915 00 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM FC722 V5631915 00

NOT MOUNTED

Item 0071 0073

SUBSTITUTES

Order Number	Description	Item
V603593	RGB INPUT BNC 01	0070 replaced by
V6035937	RGB INPUT TNT NLT 00	
V3131400	J BNC P 1 50E	0072 replaced by
V313152	J TNT FCT P 1 50E	

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD CERAM. FC722 V5631916

Order number of a complete RGB BOARD CERAM. FC722: V5631916 00 Date: 01/12/92 Differences between RGB BOARD BNC V5631210 and RGB BOARD CERAM. FC722: V5631916 00

SUBSTITUTES

Order Number	Description		Item	
V137537 V1375370	U 74HCT4053 U 74HCT4053	DIP16 P DIP16 M	U7,U9,U11	replaced by
V1341431 V1321940 ADDED	U 062I TL U 072 TL	DIP8 I DIP8 M	U17	replaced by
Order Number V395154	Description FLUORAD FC -	722	Item 0200	

2.2 DEFLECTION BOARD

General

Following tasks are done by the deflection board:

- horizontal deflection
- vertical deflection
- quick degauss (resonant type)
- vertical magnetic field compensation
- axial magnetic field compensation
- generate parabolic waveforms for dynamic focus
- generate control or drive signals for other units

The deflection unit is very flexible:

- real multisync, autolock
- horizontal: 47 94 KHz (type I, MPRD9651) / 32 64 KHz (type II, MPRD9643)
- vertical: 40 120 Hz
- equalizing pulses do not destabilize synchronization
- yoke impedances from 80 to 180 µH can be driven
- minimum hor. blanking: 3,2 μs
- minimum vert. blanking: 250 µs
- flyback pulse width of $2.6 + /- 0.1 \mu s$ (120 μH yoke)

The deflection unit, together with the processor unit set up an intelligent deflection system that recognizes and locks on different scanning systems.

In addition, several corrections to obtain a good image geometry are executed automatically.

If desired, the image geometry for a particular scanning can be adjusted or optimized by altering only 4 scanparameters on the keypad.

To achieve this, a microprocessor (68000) and a microcontroller (8031) are built in.

The microprocessor on the processor board does all the arithmetic, as well as the logic control, the 8031 integrated with the deflection board only supports the microprocessor unit and has two major tasks:

- measure the frequency of horizontal and vertical scanning and send the data to the microprocessor unit
- generate 11 DC signals (digital-analog conversion with sample and hold) and some digital references for the geometrical corrections, the dynamic focus and the magnetic compensation fields (the data, necessary to generate the signals and references is sent by the microprocessor unit via a serial link)

If scanparameters change (or if the monitor is placed in another magnetic field), the 11 DC signals and the digital references completely execute the adjustments on the deflection unit.

This means no trimmers on the deflection board have to be adjusted, even shift and linearity are adapted. An adjustable coil on the deflection board is factory tuned (centre frequency of the PLL), it does not require alignment.

After the initial start-up, the keypad is used to adjust the settings for one scanning system. From now on, the processor will automatically adapt the settings for other scanning systems, only 4 settings on the keypad have to be entered for superior image geometry.

Optional Deflection board versions are described in section 2.2.8 Customized Versions (Options)

2.2.1 IOPC DIAGRAM

MPRD 9600 DEFLECTION board D

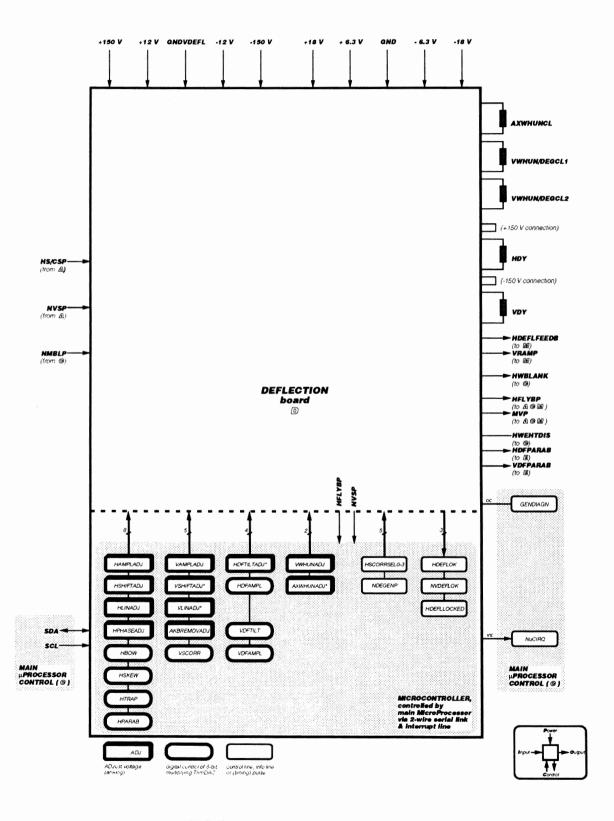
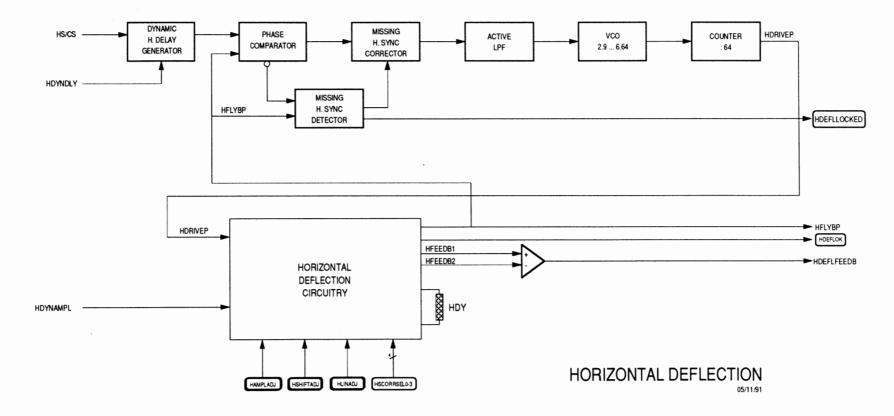
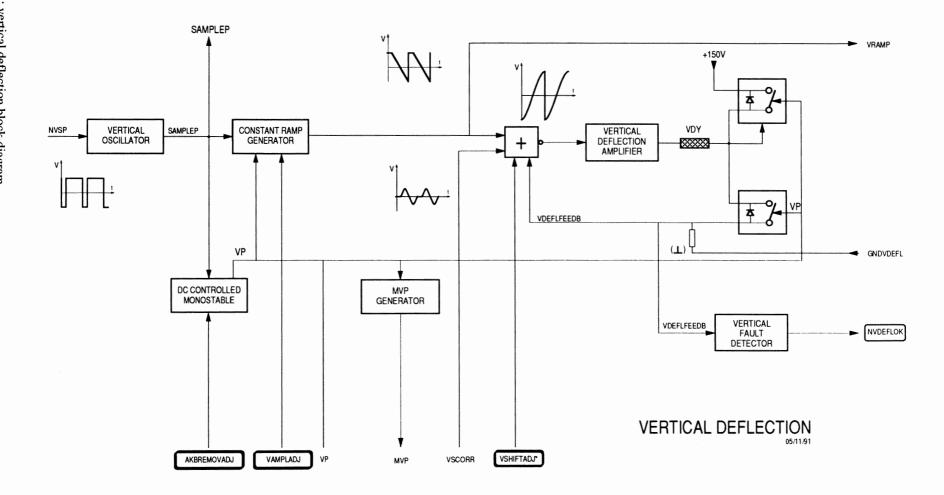
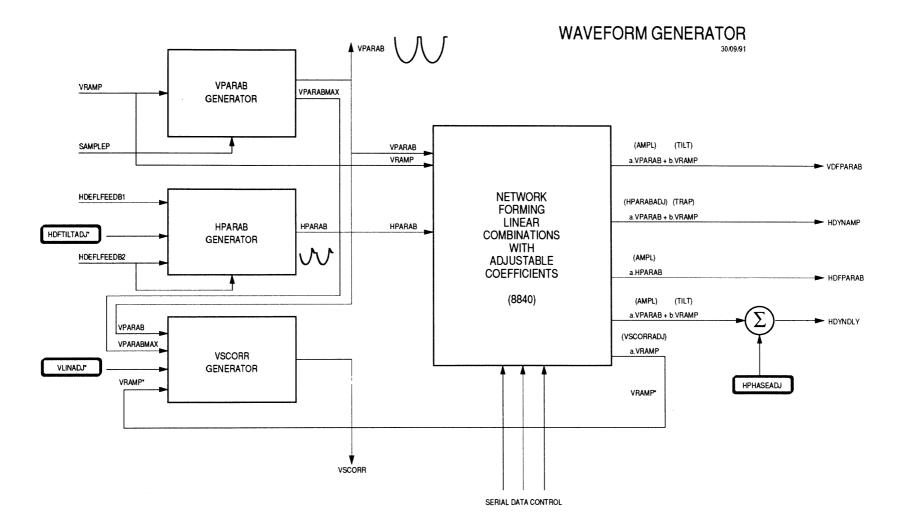


figure 2.10: DEFLECTION board IOPC diagram







2.2.3 CIRCUIT DESCRIPTION

HORIZONTAL DEFLECTION

PLL Section (sheet 3 of 7)

The signal coming from the VCO (Q11, D509) is buffered (Q12) and frequency divided by 64 (U10). The drivepulses for the power stage leave at U10, pin4.

As feedback signal, the falling edges of the horizontal flyback pulse ($600V - 2\mu s$ typ.) are used because flyback is always present during deflection.

The horizontal flyback pulses are clamped to 180 V (D515), attenuated (R507, R40), inverted (U6); the rising edges will trigger the phase comparator (U5).

As reference signal for the phase comparator, the rising edges of the delayed horizontal sync pulses will be used. The signal HS/CSP (processed horizontal or composite sync pulses) clocks the data FF (U13), Q* goes low, the constant current source (Q18) starts charging C558 (= ramp generator).

If pin 6 of the comparator (U15) gets more positive than pin 5 (HDYNDLY), the data FF will be reset and Q* goes high. The signal on pin 5 (U15) is the sum of a DC component (HPHASEADJ), a parabola (bowing) and a sawtooth (skewing), this means that the value of this signal can vary in accordance with the position of the spot.

If horizontal sync is present, the switch (U11, pin 10, 11) will be closed and the delayed horizontal sync pulses enter the phase comparator (U5).

Frequency correction

VCO frequency correct

When not triggered, the output of the PLL (U5) is floating. A rising edge on PCBin (pin 3) (hor. sync) will force the output to 0V, a rising edge on PCAin (pin 14) (flyback) will force the output to go +5V.

If the falling edge of the flyback pulse is virtually coincidental (less than 50 ns) with the delayed rising pulse of the horizontal sync pulse, the output of the PLL (pin13) will be +5V for a very short time. This short pulse will restore the charge that was dissipated in R54. R54 inserts a phase error but results in the fact that the phase comparator settles outside the dead zone with correct VCO frequency. Correct VCO frequency inside dead zone would result in jitter.

Through the switch (U11, pin 1, 2) and R81 the pulse enters the low pass filter (U12, C33) with phase lead correction (C27, R67). C556,D86,87 limit the frequencystep when scanningparameters change.

VCO frequency too low

If the falling edge of the flyback pulse is delayed, the output of the PLL (pin13) will be 0V during the delay time. As a result the negative pulse will be integrated by the low pass filter and affect the VCO frequency because it was not filtered out. The output of the opamp will rise (pulse arrives at the inverting input), this will result in a higher VCO frequency.

VCO frequency too high

If the falling edge of the flyback pulse arrives too early, the output of the PLL (pin13) will be +5V until the rising edge of the hor. sync pulse. As a result the positive pulse will be integrated by the low pass filter and affect the VCO frequency because it was not filtered out. The output of the opamp will lower (pulse arrives at the inverting input), this will result in a lower VCO frequency.

Sync fail

Under normal conditions, the filter C13, R25 will not react because PCPout (pin 1) only goes down low during the very short time interval between hor. flyback and hor. sync. If the time interval gets longer than 400ns, C13 will discharge and the circuit made up of U1 and U2 will be activated.

IC1, pin 3, 4 and 5 were low, now also pin 2 gets low, the output (pin 1) goes high and U2 (both 4 bit decade counters) are reset. As a result: - the switch (U11, pin 3, 4) will be closed

- Q0 Q3 (of both counters in U2) go low
- U6 (pin1, 2) inverts the low into high and charges C15 through R39
- pin 9-14 (U1) are low, output of U1 (pin13) goes high
- inverter U6 inverts the low level into high and the switch (U11, pin1, 2) opens

Because the low pass filter was switched off too late (time necessary to discharge C13), it has to be restored to its original value (before hor, sync was missing) by recharging the opposite amount (inverter U6 pin11,10) into the low pass filter during the same interval of time. The duration is determined by C15, R39 having the same time constant as C13, R25. The output of U1 (pin1) goes low and switch U11 (pin3,4) is opened again, ending the restore sequence. Both switches (U11 pin1,2 and pin3,4) are now open, the input of the low pass filter is floating and the VCO will oscillate on a fixed frequency.

Meanwhile U2 is counting flyback pulses; after 8 flyback pulses, Q3 (pin6) goes high, 2 flybackpulses later Q3 (pin6) goes low again.

On the falling edge the other counter in U2 is clocked and Q0 (pin11) goes high. The output of the nor gate U1 (pin13) goes low. Inverter U6 (pin8, 9) closes switch U11 (pin1, 2), the low pass filter is reconnected with the phase comparator and the VCO can lock again.

The VCO needs some time to be able to lock, for this reason another 70 flybackpulses will be counted before Q3 (U2) goes high. As long as U2,Q3 was low, pin3 of U1 was high and thereby disabling a new "hor. sync lost" sequence.

Three output signals of the PLL are used for driving other circuits:

- the DRIVEPULSE 50% DC (U10, pin4)
- the hor. flyback pulse 5Vpp
- PWMTRP, a signal to modulate the scanvoltage
 - normally it is the inverted HFLYBP, but after start-up when deflection is still disabled this signal will be the inverted DRIVEPULSE

Horizontal Output Stage (sheet 4 of 7)

The two deflection transistors (Q508, Q509) are driven by a single transformer (T500). This has several advantages:

- 1000 V transistors can be used because the flyback pulse is symmetrical against 0V
- storage time equalizing is obtained by use of identical, bifilar wounded secondary windings
- energy saving.

The deflection current (sawtooth) is generated by discharging C509 via the current sense (T502), the deflection yoke, the pump (T503), and the power transistors (Q508, 509). During the first half of flyback (Q508, 509 go off after storagetime), the energy in the deflection yoke will charge the flyback capacitors (C518, C513), the current will drop to 0A rapidly because of the increasing opposite voltage. During the second half of flyback, the flyback capacitors will discharge (current goes in opposite direction) via the deflection yoke, the pump and the current sense transformer. As soon as the flyback capacitors are discharged, the diodes (D501, D502) take over (= end of flyback).

The horizontal scan (left to right, spot is now on the left side) starts, the current through the deflection yoke drops (scanvoltage forces current in other direction), little time before the current would be 0A (spot in middle), the powertransistors will be driven again by T500, C509 is discharging again.

The difference in storage time of the deflection transitors is automatically equalized by T500.

The fastest transistor (shortest storage time) will be off first, and have a lower voltage over the b-e junction than the slower transistor. A different voltage across the identical secondary windings of T500 will result in a current, as these secondary windings are bifilary wound. The current is powered by the slower transistor, turning off itself rapidly.

Driving circuit for T500

The base current of Q508,509 is determined by the energy stored in the magnetic field of T500. T500 operates in flyback mode, when Q511 is blocked by the inverted drivepulse the energy in the magnetic field will generate current in the secondary windings and drive Q508,509.

Base current modulation

The gate of Q510 is driven by a pulse width modulated signal, the pulse width is determined by HAMPLADJ and the voltage over R508//C63 (T500 primary current sense), the drivepulse will trigger the circuitry.

When the drivepulse (duty cycle 50%) goes high:

- Q1 will conduct and C517 discharges instantly
- the output of the comparator (U18, pin1) will be low
- Q3 and Q510 will be on.
- the rising edge of the drivepulse is inverted by Q9, Q511 goes off, Q508,509 are on.

The resistors R505,506 make sure that both deflectiontransistors have equal base current (current drive).

When the drivepulse goes low:

- Q511 will be on, the current through Q510, T500 and Q511 is sensed by R508//C63
- the difference between the current sense signal and HAMPLADJ is integrated (U14, R77, C39)
- Q1 goes off and the ramp across C517 starts
- Q508,509 are off after storage time (D504,505 ensure fast switch off)

As soon as the ramp across C517 exceeds the voltage across R94 the output of U18 (pin1) will be floating. Q3,510 will be off, Q4 is on. T500 tries to prolong the current through Q511 and D508 until the drivepulse goes high again. D15 ensures a minimum pulse width, to be sure Q508,509 are off during flyback.

Larger pulsewidth is obtained by a higher HAMPLADJ. This will force U14 pin1 to a higher level, the ramp will need more time to exceed this higher level, Q510 will be on for a longer time, resulting in more energy stored in the magnetic field of T500.

S-correction capacitors

For different frequencies and amplitudes an adapted value of the S-correction is required. C505 - C508 can be switched in parallel with the main S-correction capacitor (C509).

This can be done by switching the fets (Q504 - Q507). These fets have common source, because the sources receive flybackpulses, the gates are driven by optocoupler.

The flybackpulse is capacitively coupled (C503), D5 prevents discharging C24 after flyback, D6 limits the voltage across C24 to 10V, D4 discharges C503 after flyback.

The 4 fets are turned on by the voltage across C24, the phototransistors inside the optocouplers are off if HORCORRSELX is low. A high level of HORCORRSEL0-3 will switch OFF the S-correction capacitors C505-508. R8-11 limit the current through the fets after power up or switching.

Horizontal linearity coil

The premagnetization of the linearity coil (T503), regulating the horizontal linearity, is determined by the current in the slightly coupled secondary.

The current is sensed by R259(negative polarity), this signal is compared with HLINADJ (a fixed positive DC-voltage for a certain frequency and scan amplitude). Both signals are connected with the inverting input of U17, the non-inverting input is connected to 0V. The output voltage of U17 will regulate the base current of Q514, according to the level of HLINADJ. If the current through the secondary of T503 is too high (low), the inverting input of U17 will be more (less) negative and the base current of Q514 and the current in the secondary winding of T503 will decrease (increase). D52 protects Q514 against reverse signals.

To reduce ringing in the deflectionyoke, T503 is damped. During flyback D68 will be polarised inversely and there will be no damping (spot is invisible during flyback, energy saving), immediately after flyback D68 will conduct and the ringing will be damped by R528.

Horizontal shift

Horizontal shift is obtained by sending a DC-current through the horizontal deflection yoke, this current is powered by T501. The primary of T501 is driven by a pulse width modulator.

After flyback, the DRIVEPULSE turns on Q2 during a very short time (capacitively coupled with C38). C516 is discharged instantly, when Q2 goes off again C516 is charged by R93.

The current in the primary of T501 is sensed by R512 and connected to the inverting input of U17,pin6. U17 integrates the difference between the current sense signal and HSHIFTADJ. The ramp across C516 is compared with the clipped outputsignal of U17,pin7, as long as the level of the ramp (U15,pin3) does not exceed the level of U15,pin2 the output (U15,pin1) will sink current, Q21 is on and powering T501. As soon as the level of the ramp exceeds the level of U15,pin2 Q21 is switched off. C124 accelerates Q21 switch-on, R141 accelerates Q21 switch-off, resulting in a lower power dissipation; D37 limits inverse polarisation of Q21.

The current pulses in the secondary are rectified and buffered by C533. The voltage across C533 will force a dc current through the shiftchoke (L504), T503, the horizontal deflection voke and the current sense (T502).

The shiftchoke (9,2mH) prevents the deflection current going through D511,T501 and C533.

This circuit can only shift the picture on the CRT to the left hand side.

By blanking the ringing, the picture will be a little to the right hand side, shifting to the left hand side will centre the picture.

+B Modulation (HAMPLMODULATION)

The scanvoltage across C509 is powered by the + and -148V power supply.

The scanvoltage determines the scanamplitude and so the width of the image on the screen.

The scanvoltage is pulse width controlled.

The current through the deflection yoke is sensed by a current transformer (T502). The hundredth part of the deflection current flows through the secondary of T502 and is rectified by D36,38,41,44 (full-wave rectifier).

T502 forces the current to flow, independent from the voltage drop over the diodes and R513,514,515. The voltage across R513 is a measure for the average value of absolute value of the deflection current, the ripple is attenuated by C79, R154 and C78. The smoothed signal is connected to the inverting input of U14(pin6), together with HDYNAMPL (east-west and trapezium), the non-inverting input (pin5) receives HAMPLADJ. The opamp (U14), compensated by C515,R509 and C522,R510, amplifies the difference between both signals. The output of U14 (pin7) is connected via R127,C82 (smoothing), D34 (+5V clamping) and D29 (-0,7V clamping).

A rising edge of PWMTRP (= inverted HFLYBP) will switch on Q6 shortly, discharging C514, the voltage at pin6 of the comparator (U18) will be 0, the output of U18(pin7) will be high, powering the horizontal deflection output stage. As soon as the ramp across C514 exceeds the level on pin5 (U18), the output of the comparator (U18,pin7) will go low and the horizontal output stage will not be powered any more.

On +A (+148V) powerfailure, the +15V will charge C514 to limit the duty cycle to a safe value; D14,17 protect U18 against overvoltage.

As soon as U18,pin5 goes high:

on the +148V side - Q20 will go on

- the gate-source capacitor of Q512 will be discharged by Q19 (Q512 goes on)

- Q19 will go on during discharging

- Q15 will go off

on the -148V side - Q25 will go on

- the gate-source capacitor of Q513 will be charged by Q24 (Q513 goes on)

- Q24 will go on during charging

- Q26 will go off

As soon as U18,pin5 goes low:

on the +148V side - Q20 will go off

- the gate-source capacitor of Q512 will be charged by Q15 (Q512 goes off)

- Q15 will be on during charging

- Q19 was off already

on the -148V side - Q25 will go off

- the gate-source capacitor of Q513 will be discharged by Q26 (Q513 goes on)

- Q26 will be on during discharging

- Q24 was off already

The signal PWMTRP goes high, immediately after flyback.

Only the +148V side will be described, the -148V side is identical.

Q512 goes on, D502 is conducting (always after flyback), the full+148 Vdc stands across L500, the current through L500 starts from 0 and increases. Little later, Q512 is switched off and the current through L500 remains stable going through D502 and D510. Before the deflectioncurrent becomes 0, Q508,509 will go on, the current forced by L500 now goes through Q509,D510. When Q508,509 are off again, flyback starts and the current forced by L500 will help charging C513 (first half of flyback). The energy from the powersupply, first stored in the magnetic field of T500

will now be transferred to C513. When C513 discharges (second half of flyback) the energy from the powersupply will be stored in C509, in this way the scanvoltage is sustained.

However, the high amplitude of the flybackpulse (voltage across C513) will inject a current through L500 in the opposite direction. Near the end of flyback, the sense of the current through L500 changes and C521 will charge to 148V. Once C521 is charged to 148V, the internal diode of Q512 will conduct and energy will be delivered to the +148V power supply. This means that not all the energy stored in L500 will be used to sustain the scanvoltage. The charging of C521 has an important advantage, when Q512 is switched on again (shortly after flyback C521 is still charged) the fet will not dissipate because it has the same voltage on drain and source. When Q512 is switched of rapidly, the drainvoltage will only be a little smaller than the sourcevoltage and power losses by switching will be very small.

Another target of C512 is to reduce the slew rate of the drainvoltage. When Q512 is switched off, D510 will conduct and the voltage at the drain drops to 0V. All this happens during active video, via the parasitic capacitance of L500 an oscillation in the deflection current could be provoked but it will be attenuated by C521.

Vertical Scanfail Detection (VSCANFAILDET) (sheet 3 of 7)

The symmetrical sawtooth VFEEDBACK is clamped by D43 to limit the negative alternations to 0.3V, C91 eliminates noise. R170, R180 give positive feedback, due to hysteresis the signal on U22,pin 8 will need minimum amplitude to switch the output U22,pin14 to low or high. If the VFEEDBACK is ok, a square wave will be present at U22, pin14. This square wave is capacitively coupled (C84) to the rectifier D40, D45 and C94.

If the vertical deflection is ok, C94 will be charged, Q28 is on, NVDEFLOK is low.

If the vertical deflection fails, Q28 will be off, NVDEFLOK goes high limited to 5V by D47, HWBLANK goes high, Q34 goes on, via D51,R210 Q29 is switched on and HWEHTDIS (on the processorboard connected to the +5V by R86) goes low. Led D518 will light, via D59 GENDIAGN goes low, the microprocessor will order a diagnose. Q34 shorts VP to ground, this to prevent the AKB-circuitry from interfering with HWBLANK.

Horizontal Scanfail Detection (HSCANFAILDET)

HAMPLSENSE is used to detect HSCANFAILDET. This is a smoothed signal, coming from the horizontal current sense. This signal is smoothed again by R178,C87. If the signallevel on U22, pin5 exceeds the signallevel on U22,pin4 the horizontal deflection amplitude is considered to be normal; U22,pin2 (=HDFLOK) will be +5V, (limited by the internal protection diode of U11,pin6); Q27 will be on.

If the horizontal deflection fails, HDEFLOK goes low, Q27 will be off, via D48,R210 Q29 is switched on, HWBLANK goes high, Q34 goes on and HWEHTDIS (on the processorboard connected to the +5V by R86) goes low. Led D518 will light, via D59 GENDIAGN goes low, the microprocessor will order a diagnose. Q34 shorts MVP to ground, this to prevent the AKB-circuitry from interfering with HWBLANK.

Overcurrentprotection

The signal HAMPLSENSE is also used for the overcurrentprotection. If HAMPLSENSE exceeds the signallevel of U22,pin10 it means that the amplitude of the horizontal deflection current is too high. In this case, U22 pin13 will go low, C75 will be discharged instantly, SOFTSTART is pulled to ground. C82 will be discharged (see also deflection board sheet 4 of 7 HAMPLMODULATION and the paragraph +B Modulation) via Q42,D88, reducing the pulsewidth and the horizontal deflection current.

Soft Start

During power up, as long as the +15V does not exceed 10V yet, Q23 will be off, Q22 will be on, C75 can not be charged and the pulsewidth (=horizontal amplitude) is limited. When the +15V exceeds 10V, Q23 will be on, Q22 will be off and C75 is charged slowly by R153, Q42 will go off slowly a little later, the horizontal amplitude can now increase gradually, controlled by HAMPLSENSE.

Power fail

As soon as the +15V power supply drops below 10V, Q23 will be off, Q22 will be on discharging C75 rapidly, the pulsewidth drops to a low level, the deflection transistors Q508,509 will dissipate little power, the amplitude of the flybackpulses are reduced to a safe level. In case that, due to powerfail, the base current modulation circuit would not be triggered in a proper way, the deflection transistors Q508,509 will not be damaged or destructed.

VERTICAL DEFLECTION (sheet 6 of 7)

The vertical deflectioncoil is connected to a class AB push-pull amplifier. The powertransistors Q501,503 are driven by Q500,502. Physically the vertical deflection has a separate ground (GNDVDEFL), however, it is electrically connected with the common ground of the deflection board.

The vertical deflectioncurrent is sensed by R524//R525.

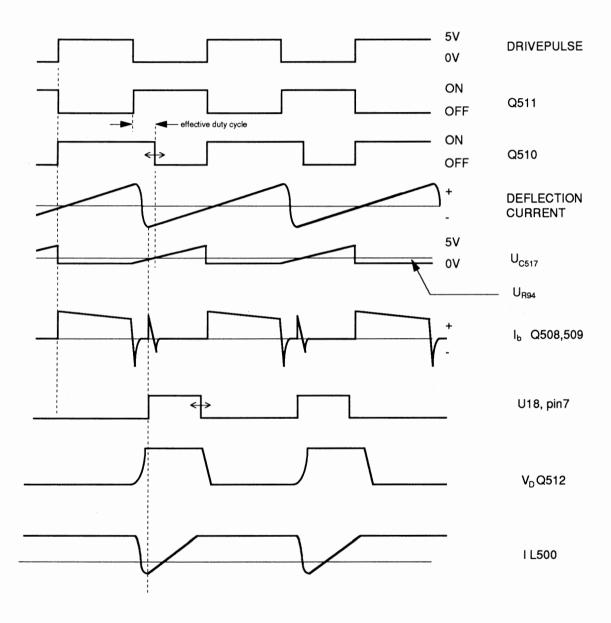


figure 2.14: horizontal deflection waveforms

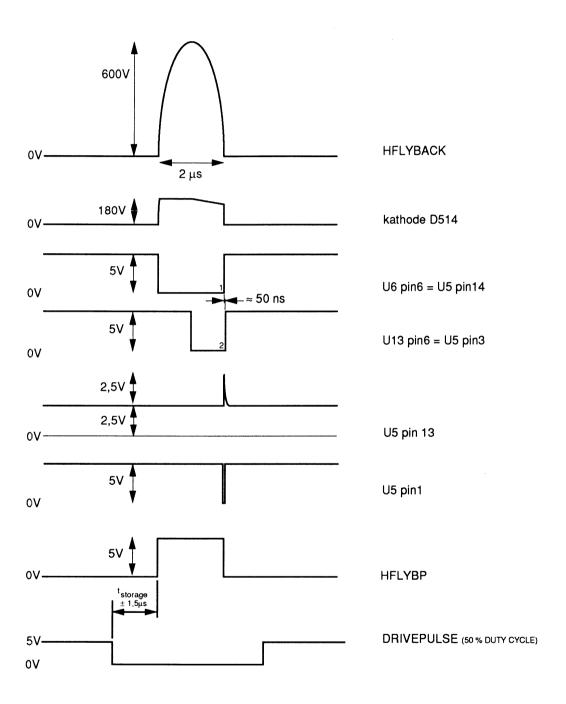


figure 2.15: flyback waveforms

The ramp for the vertical deflection is generated by charging C542 with a constant current. The constant current is generated by U30,pin 8 and R252. C542 is discharged by U33 pin1,15 during the high level of VP. Just before vertical retrace, the inverted VRAMP (U30,pin14) is sampled by U33; the difference between the sample and VAMPLADJ is integrated by C545 to obtain a symmetrical sawtooth with amplitude VAMPLADJ.

The signal NVSP, coming from the SYNC&SCALING module is processed by U34, resulting in a stable SAMPLEP, even with distorted or absent NVSP.

(sheet 3 of 7)

The falling edge of SAMPLEP triggers U13, Q goes high (=VP), Q* goes low (=NVP). Q13 goes off, C557 charges, as soon as the voltage across C557 exceeds the voltage on U22(pin7) (determined by AKBREMOVADJ) U13(pin 13) goes low. The duration of VP is determined by AKBREMADJ and used to start the retrace.

(sheet 6 of 7)

During retrace the signal VP will be high: - switch U33 pin15,1 will be closed

- C542 will discharge immediately
- Q36 will be on and discharge the gate-source capacitor of Q516
- Q516 will be off.
- the current through the deflection coil will continue through the internal diode of Q517; the voltage on the drain of Q517,516 is now 150V
- the current through R521 turns on Q35, Q517 is closed by Q35
- the 150V power supply is used to achieve a fast vertical retrace.

After retrace the signal VP will be low:

- Q33 will be on, Q35 will be off
- Q517 will be off, Q36 will be off, charging the gate-source capacitor of Q516
- C542 will be charged again, the vertical ramp starts

RESONANT DEGAUSS (sheet 7 of 7)

The -148Vpp is added to the +148V by C539, D100 and D101. C536, C544, C554 and C553 are charged to approxima-tely 300V in a few seconds.

When the μP orders to degauss, NDEGENP goes low during 50ms typical, Q30 goes off. As soon as VMIDP gets positive (>0.7V) U28(pin2) goes high (this happens during the second half of the vertical scan) (positive feedback with R244 keeps U28(pin2) high until NDEGENP* goes high), Q40 turns on Q520 starting the degauss cycle.

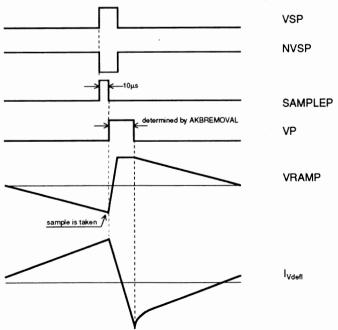


figure 2.16: vertical deflection waveforms

Degaussing is obtained by driving a damped alternating current through the degauss coils. The degauss coils, together with R517//D516//D517, switch Q520//D519 and C536//C544 set up a resonant circuit.

As the degausscurrent increases (C536,544 discharge), the voltage across R517 gets more negative, U28(pin1) remains low. After being discharged completely, the two capacitors will be recharged (opposite polarity), forced by the energy in the magnetic field of the degauss coil. The current drops to 0 (max. voltage across C536,544) and becomes negative, resulting in a positive voltage across R517. U28(pin1) goes high, the rising edge forces U28 (pin14) to a low level for a short time. Q37 goes on, the current through the primary of T504 turns on Q521, C553 will deliver a supplementary charge for C536,544 stimulating the oscillation.

Half a period later, the current drops to 0 again (max. voltage across C536,544) and becomes positive again, resulting in a negative voltage across R517. U28(pin1) goes low, the falling edge forces U28 (pin13) to a low level for a short time. Q41 and Q522 go on, C554 will deliver a supplementary charge for C536,544 stimulating the oscillation. The two chargepumps improve the quality factor of the oscillation.

VERTICAL WHITE UNIFORMITY ADJUST (VWHUNADJ)

The degauss coils are also used for VWHUNADJ. The current for VWHUNADJ is powered by the -6.3V power supply and sensed by R517. The difference between the voltage across R517 and VWHUNADJ is integrated, U31(pin1) drives Q515.

During degauss, the emitter of Q40 will be at +10V, via D69, R261,255 the inverting input of U31(pin2) will be high, U31(pin1) will go low and Q515 will be off, disabling VWHUNADJ and protecting Q515 against overdissipation.

AXIAL WHITE UNIFORMITY ADJUST (AXWHUNADJ*)

The AXWHUNADJ is obtained by sending a current through the AXWHUCL. AXWHUNADJ* drives the non-inverting input of U31(pin6). The current through AXWHUCL is sensed by R522 and fed to the inverting input U31(pin6) via R270. The difference is integrated and buffered by Q518,519.

During degauss AXWHUNADJ is disabled to obtain a complete demagnetization of the CRT. During degauss the emitter of Q40 will be at +10V, Q39 will be on, fet Q38 will be on and the non-inverting input of U31(pin5) is at OV, the current through the AXWHUCL drops to 0.

MICROCONTROLLER (sheet 2 of 7)

The microcontroller (8031 - 8 bit) only executes minor tasks, the major work is done by the microprocessor (68000 - 16 bit) on the processorboard.

The microcontroller controls several functions:

- DAC refresh, demultiplexer
- frequency (hor. & vertical) measurement
- checking hor. & vert. deflection
- degauss
- S-correction switching
- trimdac driving
- generate an interrupt when frequency changes

The µcontroller and µprocessor are linked by a serial line (SCL, SDA), the µprocessor is the master.

D82,83 and R237,231 protect the serial line against possible peakvoltages.

The watchdog (U32) controls if MUXA 0 (U32,pin3) is addressed regularly, if not, U32,pin2 will go high resetting the μ controller.

The EPROM (U511) containing the program is addressed by the μ controller via a latch (U23). This is necessary because the databits 0-7 are multiplexed with the addressbits 0-7. When addressing the EPROM, the lower byte of the address is latched in U23, the higher byte of the address is connected directly to the EPROM. When U511,pin22 is set high by the μ controller, the data will be present on the databus.

DAC refresh, demultiplexer (sample and hold)

Sending data to the DAC is done by putting the data on the databus and latching it with U24. This latch is activated by addressing 8001H, addressbits 0,15 must be '1', WR* (U510,pin16) must be '0'; U29,pin6 goes low. The data is transferred to U512, the DAC generates a current according to the data on the input (U512,pins 5-7). The current is converted in a DC voltage by U27,pin1 and enters the demultiplexer U16. The outputchannel of the demultiplexer is selected by MUXA0-MUXA3 (16 outputs, 12 used), MUXEN enables the demultiplexer. As the multiplexer is fed by +15V (U16,pin24), these signallevels must be converted to +15V, this is done by U509, R201,214,219,207,197. The demultiplexer scans the sample and hold circuits, the RC-networks are buffered by an opamp with high impedance.

For HAMPLADJ, two signals are used, one devided by 100 and added to the other. This gives a "slow" (fine) and a "fast" (coarse) HAMPLADJ.

HORAMPLADJ, AKBREMOVADJ, VLINADJ*, HDFTILTADJ*, VAMPLADJ, VSHIFTADJ* and AXWHUNADJ* are rescaled after buffering.

Frequency (hor. & vertical) measurement

The frequency measurement is triggered by NVSP and HFLYBP, generating an interrupt (U510, pin12 U510,pin15) The frequency is calculated by the µcontroller; when requested, the calculated data is sent to the µprocessor for further processing. If scanparameters change during frequency measurement, HDEFLLOCKED (U510,pin13) will go low, cancelling the frequency measurement.

Checking hor. & vert. deflection

In the fault indicator on the front panel lights up, the operator can check the diagnosis on the keypad. The µprocessor will ask the µcontroller to check the signals HDEFLOK (U510,pin7) and NVDEFLOK (U510,pin8) and report their status.

Degauss

A degauss request is sent to the µcontroller (via the serial link), NDEGENP (U510,pin14) goes low (50 ms).

S-correction switching

The µprocessor orders the µcontroller to activate HSCORRSEL0-3 for optimal horizontal S-correction. The calculations to determine optimal S-correction are done by the µprocessor. During start-up U26,pin1 goes low, all S-correction capacitors are active to protect the fets Q504-507.

MULTIPLIERS (sheet 5 of 7)

For horizontal and vertical dynamic focus, parabolic waveforms, synchronised with horizontal and vertical deflection are required.

For vertical linearity adjust, east-west correction and bowing, a parabolic waveform synchronised with the vertical deflection is required, for vertical S-correction a third order waveform is required.

These second and third order waveforms are generated by multiplier circuits.

U503, U504 and U507 are four-quadrant multipliers, they are followed by an opamp for good operation (U3, U4). U503 squares the inputsignal VRAMP, connected to the inputs (U503, pin8,12). The complementary outputsignals (U503,pin2,pin14) are connected to an opamp (U4,pin3,2).

U507 multiplies the difference between HFEEDB2 (U507,pin4) and HFEEDB1 (U507,pin12) (HFEEDB2 - HFEEDB1 = ramp). An additional signal HDTILTADJ* is connected to U507,pin9; it allows tilting of HPARAB. The complementary outputsignals (U507,pin2,pin14) are connected to an opamp (U3,pin3,2).

U504 multiplies (VRAMP*) by (VPARAB - VPARABMAX), VLINADJ* allows vertical linearity adjust; the complementary outputsignals (U504,pin2,pin14) are connected to an opamp (U4,pin5,6).

During flyback or retrace, it is undesired to let the parabolic waveform pass to other circuitry, this would result in unnecessary transients causing distortion.

The output of U4.pin1 is connected to switch U8.pin2; as long as SAMPLEP is low, U4.pin1 is connected to U7.pin3

and VPARAB equals VRAMP². SAMPLEP, going high just before vertical retrace, will charge C47 via D16,R105, U8.pin10,11 go high, U8.pin15 is floating, VPARAB remains on the same level, driven C43 (track and hold circuit); C510 is charged by U7.pin 1 via U8 pin13,14. 10µs later, SAMPLEP goes low again, C47 will discharge via R95 and after approximately 15µsec (time for VRAMP to end retrace) the switches are in the original position again. The sample and hold circuit U8,C510,U7 holds VPARABMAX, this signal is required to compose VSCORR. (VSCORR must not affect vertical amplitude).

The output of U3,pin1 is connected to switch U8,pin5; as long as HFLYBP is low, U3,pin1 is connected to U9,pin3, HPARAB equals a tilted parabola. HFLYBP, high during flyback, will connect U9,pin3 with C512 via U8,pin4,3.C512 is charged by U9,pin7 via D8 (peak detector). The peak detector is triggered by HFEEDB2; only during the first half of the scan HFEEDB2 will be negative, Q5 will be off for a short time and C512 will be charged to the peak level of U3,pin1 (during the second half of the scan HFEEDB2 is 0V, Q5 is on and the peak detector is disabled), this means that when HFLYBP goes high, U9,pin1 will be preset to the startlevel of the next parabolic waveform (equal to the startlevel of the previous parabolic waveform).

Dynamic Focus disable during vertical retrace for stable AKB

NMBLP goes low during horizontal and vertical blanking.

C59 will not discharge sufficiently during horizontal blanking, however, during the vertical blanking Q7 will be off during a longer time, U8,pin9 will go high. HPARAB will be preset to the maximum value of the previous parabolic waveform, during vertical retrace HPARAB is kept constant to ensure stable AKB measurements.

Trimdac

All signals used for geometry correction are keypad controllable, a software controlled trimdac (U508) trims the signallevels. The serial communication between the trimdac and the µcontroller is controlled by SDI (U508,pin20), CLK (U508,pin17) and LD (U508,pin16). These pins are connected to the databus of the µcontroller via a latch (U26,pin12,13,14 see sheet 2 of 7). NPR (U508,pin7) resets the trimdac after start-up until µcontroller takes over control. The trimmed levels are buffered by U19, HDFPARAB (U19,pin1) is the AC coupled rescaled HPARAB; VDFPARAB (U19,pin7) is the summation of the rescaled VPARAB with the rescaled VRAMP; HDYNAMPL (U19,pin8) is the summation of the rescaled VPARAB with the rescaled VRAMP; HDYNDLY (U19,pin14) is the summation of the rescaled VPARAB with the rescaled VRAMP and HPASEADJ.

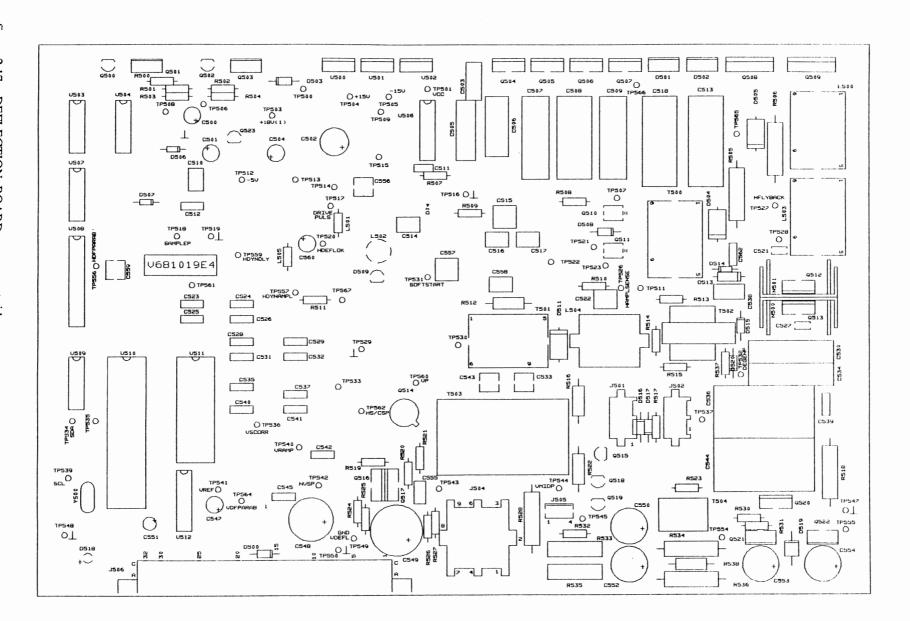


figure 2.17: DEFLECTION BOARD component side

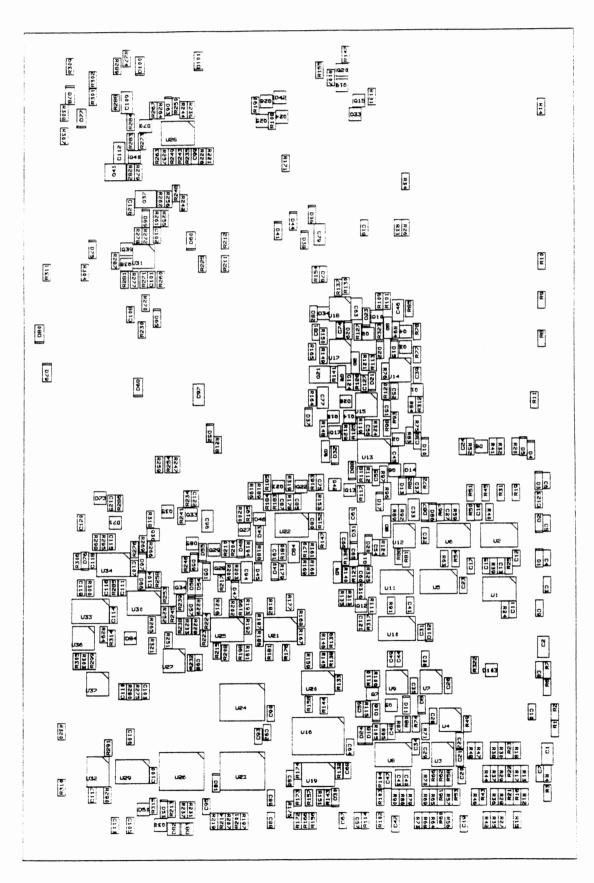


figure 2.18: DEFLECTION board solder side

2.2.5 PARTSLIST

17" VERSION

Order number of a DEFLECTION BOARD 32/64 KC MPRD9643: V5631235 20 Date: 01/12/92

Order number	De	escription	Item
V1011369	R	CFFH 1K J 0W25	R526
V101200	R	MF H 1E J 0W5	R501,R502,R503,R504
V101207	R	MF H 3E9 J 0W5	R508
V101208	R	MF H 4E7 J 0W5	R531
V101212	R	MF H 10E J 0W5	R500,R517
V1012129	R	CFFH 10E J 0W5	R533, R535
V101214	R	MF H 15E J 0W5	R530
V101216	R	MF H 22E J 0W5	R523
V101223	R	MF H 82E J 0W5	R539
V101228	R	MF H220E J 0W5	R527
V101248	R	MF H 10K J 0W5	R520
V101252	R	MF H 22K J 0W5	R509
V101256	R	MF H 47K J 0W5	R519,R537
V101260	R	MF H100K J 0W5	R507, R521
V101262	R	MF H150K J 0W5	R532
V101504	R	MF H 2E2 F 0W4 E2	R524,R525
V101513	R	MF H 12E F 0W4 E2	R513
V101517	R	MF H 27E F 0W4 E2	R514,R515
V101539	R	MF H 1K8 F 0W4 E2	R510
V101548	R	MF H 10K F 0W4 E2	R539
V101568	R	MF H470K F 0W4 E2	R511
V102300	R	MF H 1E J 2W5	R505,R506
V102312	R	MF H 10E J 2W5	R534,R536
V102330	R	MF H330E J 2W5	R528
V102349	R	MF H 27K J 2W5	R518
V102915	R	MF H 18E J 1W6	R512
V102924	R	MF H100E J 1W6	R516,R522
V1114005	С	EL RA 47M M200E3 105	C549
V1114169	С	EL RA 10M M350E2 105	C550,C552
V1114689	С	EL RA 470M M 16E2 105	C502
V111476	С	EL RA 4M7M400E2 105	C553,C554
V111489	С	EL RA 470M M 35E2 105	C548
V1114932	С	EL RA 4M7M 50E1 105	C551
V1114972	С	EL RA 100M M 10E1 105	C560
V1115109	С	EL RA 22M M 25E2 105	C500,C501,C504,C547
V111681	С	EL BRA 22M M 25E2 85	C559
V111725	С	COG MU 1N5K200E2 125	C521,C527
V112090	С	CE DI 47P K102E3 HV	C538
V1120901	С	CE DI 100P K102E3 HV	C503
V112683	С	N750MI 22P G500E2	C511
V1127020	C	X7R MU 10N K200E2 125	C562
V1127040	С	X7R MU 4N7K200E2 125	C555
C112825	C	CE DI 1N S400E2	C539
V114051	C	POMERA 560N K250E9 85	C530,C534
V1140584	C	POMERA 2M2K400E11 85	C536,C544
V114082	С	POMERA 22N K 63E2 85	C542
V114088	C	POMERA 100N K 50E2 85	C512,C523,C524,C525,C526,C528,
			C529,C531,C532,C535,C537,C540,
			C541,C545
V114092	С	POMERA 470N K 50E2 85	C510
V114099	С	POMERA 3M3M 50E2 85	C533, C543, C556

Order number	Description	Item
V115006	C PPMERA 12N J102E9 HV	C513,C518
V1150652	C PPMERA 120N K250E6	C505
V1150692	C PPMERA 270N K250E9	C506
V1150712	C PPMERA 390N K250E9	C509
V1150722	C PPMERA 470N K250E9	C507
V1150762	C PPMERA 1M K250E11	C508
V115159	C PP RA 680P J100E2 85	C516
V115161	C PP RA 1N J100E2 85	C514,C517
V115162	C PP RA 1N5J100E2 85	C558
V115167	C PP RA 4N7J 63E2 85	C515,C522
V116304	C PP RA 6N8H 63E2 85	C557
V1314182	Q BC559C P SS T092	Q523
V131426	Q BC337 N SS T092	Q518
V131432	Q BC161-10 P P TO39	Q514
C131646	D 1N4007 R DO41	D516,D517
V131662	D LED D3 T RED	D518
V131688	U 521-4 TLP DIP16 P	U506
V131729	D ZEN 4V7 0W5 C DO35	D506,D507
V131776	D ZEN 180V 0W5 C DO7	D515,D520
V131827	D BB212 VAR TO92	D509
C131907	D BY584 R SOD61A	D513,D514
V131914	D BYW96E AFSR SOD64	D519
V131911 V131930	D SB130 SCH F126	D500,D503,D508
V131954	D BYV27-200 R SOD57	D510,D512
V131954 V131956	D MUR10120E UF R TO220	D501,D502
V131930 V132024	D VSK340 SCH	D504, D505, D511
V132024 V132209	Q TYN1004 TH P TO220	Q520
V132500	Q MPSA44 N SS T092	Q515
V132500 V132501	Q BC327-25 P SS T092	Q519
V132501 V132554	Q BC546B N SS T092	Q500
V132555 V132555	Q BC556B P SS T092	Q502
V132568	Q MJW16010A N P TO247	Q508,Q509
V1325791	Q BD651F DN P SOT186	Q503
V1325751 V1325841	Q BD652F DP P SOT186	Q501
V1325041 V132592	Q BUT12A N P TO220	Q521,Q522
V132602	Q IRF510 FN P TO220	Q504
V132602 V132603	Q IRF520 FN P TO220	Q505,Q506
V132614	Q IRF620 FN P TO220	Q513,Q516
V132614 V132615	Q IRF9620 FP P TO220	Q512,Q517
V132620	Q IRF530 FN P TO220	Q507
V132625	Q IRFD9110 FP P DIP4	Q510
V132630	Q IRFD110 FN P DIP4	Q511
V1327680	U 08 DAC DIP16 M	U512
V133005	Q ACC INSUL SIL TO220	0070
V133012	Q ACC HTSNK TO5	0100
V133076	Q ACC WSHR TO5	0101
V133082	Q ACC INSUL BUSH TO220	0094
V133084	Q ACC HTSNK TO92	0060
V133086	Q ACC HTSNK TO220	N500,N501
V1340100	U 7815 TO220 P	U500,N301
V1340100	U 2990-15 LM TO220 P	U501
V134044	U 2940-5 LM TO220 P	U502
V1341070	U 1595 MC DIP14 M	U503,U504,U507
V1342060	U 5407 DIP14 M	U509
V134259	U 8840 DAC DIP24 I	U508
V1372322	U 80C31BH 12MDIP40 I	U510
C302108	CORE 3.7X 1.2X 3.5	0170
C302100	COME 3.7A 1.2A 3.3	01/0

Order number	Description		Item
V3061564	CHOKE AX NS 1 MH		L501,L505
V3061364 V306410	COIL DYN LIN 6630A	00	T503
V306410 V306701	TRF DRIV AT4043/ 89	00	T504
V306701 V306726	TRF CURR AT4043 / 47		T502
V306720 V306800	X ACC INSUL HC49		0120
V306860	X 12.000000 MHZ		Y500
V311061	D ACC HLDR D3 P1 TS H 6	; 5	0160
C3132531		LP	0080
V3133042	J MNL R MBT P 2 AU		J501,J502
V3133042 V3133047	J MNL R MBT P 9 AU		J504
V3135047 V313525	J EUR3C MBS P64 E1C2 S1	6	J506
V313923	J DUBX1 MBT P 4 E1AU	. • 0	J505
V3153133	SLDRLUG SCR 1TAG D4.2 L	.26	0130
V342168		Y	0036
V3481064	W JUMP 0.6 17.78	-	R538
V3620146	SMP-I M2.5X10 D 84		0140
V3620140	SMP-I AM3 X 5 D 84		0037
V3620216	SMP-I AM3 X 6 D 84		0038,0090
V3620226	SMP-I AM3 X 8 D 84		0091
V3620246	SMP-I AM 3X12 D84		0092
V3661026	NUT DIN934 I M3		0095,0150
V3661106	NUT DIN934 I M2.5		0142
V3673896	WASHER INOX M2.5DIN137	Y	0141
V3673906	WASHER CRINKLE I M3		0039,0093,0151
V367650	MOUNTING BRACKET		0031
V5681931	SOFT DEFL.32/64KC 9600	00	U511
V6030963	CAPTIVE SCREW SPRING	01	0033
V6030964	CAPTIVE SCREW M3 X10	00	0032
V603569	KLEM TRANSISTOR 3L	00	0040
V6035692	KLEMTRANSISTOR 2L	00	0050
V6036112	HEATSINK DEFL 20H	03	0030
V603695	ISOLATION DEFLECTION	01	0035
V603731	PCB CLAMP MPRD9000	01	0152
C671005	CH 9.2 MH	00	L504
V681019	SMD DEFLECT. MPRD 9600	10	0010
V716543	PCB TESTPOINT	05	0020
V775039	COIL WH-YEL-BLA-BLA		L502
V775332	T DRIVER DEFL 9000	00	T500
V775333	T SHIFT DEFL 9000	00	T501
V775335	CHOKE POWER DEFL. 9000	00	L500,L503

20" VERSION

Order number of a DEFLECTION BOARD 47/94 KC MPRD9651 : V5631230 19 Date : 01/12/92

Order number	De	escription	Item
V1011369	R	CFFH 1K J 0W25	R526
V101200	R	MF H 1E J 0W5	R501,R502,R503,R504
V101207	R	MF H 3E9 J 0W5	R508
V101208	R	MF H 4E7 J 0W5	R531
V101212	R	MF H 10E J 0W5	R500,R517
V1012129	R	CFFH 10E J 0W5	R533,R535
V101214	R	MF H 15E J 0W5	R530
V101216	R	MF H 22E J 0W5	R523
V101228	R	MF H220E J 0W5	R527
V101248	R	MF H 10K J 0W5	R520
V101252	R	MF H 22K J 0W5	R509
V101256	R	MF H 47K J 0W5	R519,R537
V101260	R	MF H100K J 0W5	R507,R521
V101262	R	MF H150K J 0W5	R532
V101504	R	MF H 2E2 F 0W4 E2	R524,R525
V101513	R	MF H 12E F 0W4 E2	R513
V101517	R	MF H 27E F 0W4 E2	R514,R515
V101539	R	MF H 1K8 F 0W4 E2	R510
V101548	R	MF H 10K F 0W4 E2	R539
V101570	R	MF H680K F 0W4 E2	R511
V102300	R	MF H 1E J 2W5	R505,R506
V102312	R	MF H 10E J 2W5	R534,R536
V102330	R	MF H330E J 2W5	R528
V102349	R	MF H 27K J 2W5	R518
V102915	R	MF H 18E J 1W6	R512
V102924	R	MF H100E J 1W6	R516,R522
V1114005	С	EL RA 47M M200E3 105	C549
V1114169	С	EL RA 10M M350E2 105	C550,C552
V1114689	С	EL RA 470M M 16E2 105	C502
V111476	С	EL RA 4M7M400E2 105	C553,C554
V111489	C	EL RA 470M M 35E2 105	C548
V1114932	C	EL RA 4M7M 50E1 105	C551
V1114972	С	EL RA 100M M 10E1 105	C560
V1115109	С	EL RA 22M M 25E2 105	C500,C501,C504,C547
V111681	С	EL BRA 22M M 25E2 85	C559
V111725	С	COG MU 1N5K200E2 125	C521,C527
V112090	С	CE DI 47P K102E3 HV	C538
V1120901	С	CE DI 100P K102E3 HV	C503
V112683	С	N750MI 22P G500E2	C511
V1127030	С	X7R MU 100N K200E2 125	C562
V1127040	С	X7R MU 4N7K200E2 125	C555
C112825	С	CE DI 1N S400E2	C539
V114040	С	POMERA 68N K250E4 85	C505
V114051	С	POMERA 560N K250E9 85	C530,C534
V1140584	С	POMERA 2M2K400E11 85	C536,C544
V114082	С	POMERA 22N K 63E2 85	C542
V114088	С	POMERA 100N K 50E2 85	C512, C523, C524, C525, C526, C528,
			C529, C531, C532, C535, C537, C540,
171 1 4 0 0 0	~	DOMEDA ARON V. FORD OF	C541, C545
V114092	C	POMERA 470N K 50E2 85	C510
V114099	C	POMERA 3M3M 50E2 85	C533, C543, C556
V115006	C	PPMERA 12N J102E9 HV	C513,C518
V1150662	C	PPMERA 150N K250E6	C506
V1150692	С	PPMERA 270N K250E9	C507,C509

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Item
Order number Description
V1150732
              C PPMERA 560N K250E9
                                           C508
                PP
                    RA 680P J100E2 85
                                           C516
V115159
              С
V115161
              С
                PP
                     RA
                         1N J100E2 85
                                           C514, C517
                          1N5J100E2
                                     85
                                           C558
V115162
              C PP
                     RA
              C PP
                          4N7J 63E2 85
                                           C515, C522
                     RA
V115167
                                           C557
              C PP RA
                          6N8H 63E2 85
V116304
              O BC559C
                           P SS T092
                                           Q523
V1314182
V131426
              Q BC337
                            N SS T092
                                           0518
                            P P TO39
                                           Q514
V131432
              O BC161-10
                               R DO41
                                           D516, D517
C131646
              D 1N4007
                                           D518
V131662
              D LED D3
                           T RED
                                           U506
V131688
              U 521-4
                        TLP
                               DIP16 P
V131729
              D ZEN
                     4V7 0W5 C DO35
                                           D506, D507
              D ZEN 180V 0W5 C DO7
                                           D515, D520
V131776
                                           D509
                             VAR TO92
V131827
              D BB212
C131907
              D BY584
                               R SOD61A
                                           D513, D514
              D BYW96E
                            AFSR SOD64
                                           D519
V131914
                            SCH F126
                                           D500, D503, D508
              D SB130
V131930
              D BYV27-200
                             R SOD57
                                           D510, D512
V131954
              D MUR10120E
                            UF R TO220
                                           D501, D502
V131956
                                           D504, D505, D511
V132024
              D VSK340
                             SCH
V132209
              Q TYN1004
                           TH P TO220
                                           Q520
                            N SS T092
                                           Q515
V132500
              Q MPSA44
V132501
              O BC327-25
                            P SS TO92
                                           Q519
                            N SS T092
                                           Q500
V132554
              O BC546B
                            P SS T092
                                           0502
              Q BC556B
V132555
                                           Q508,Q509
                            ΝP
                                 TO247
V132568
              Q MJW16010A
V1325791
              Q BD651F
                           DN P
                                 SOT186
                                           Q503
V1325841
              Q BD652F
                           DP P
                                 SOT186
                                           Q501
                                           Q521,Q522
                            N P TO220
V132592
              Q BUT12A
                           FN P TO220
                                           Q504
V132602
              Q IRF510
V132603
              Q IRF520
                           FN P TO220
                                           Q505, Q506
V132614
              Q IRF620
                           FN P TO220
                                           Q513,Q516
V132615
              O IRF9620
                           FP P
                                 TO220
                                           Q512,Q517
              Q IRF530
                           FN P
                                 TO220
                                           0507
V132620
                           FP P DIP4
                                           Q510
V132625
              Q IRFD9110
V132630
              Q IRFD110
                           FN P DIP4
                                           Q511
                               DIP16 M
                                           U512
V1327680
              U 08
                        DAC
V133005
              Q ACC INSUL SIL
                                 TO220
                                            0070
              Q ACC HTSNK
                                            0100
                                 TO5
V133012
V133076
              Q ACC WSHR
                                 T05
                                            0101
              Q ACC INSUL BUSH
                                 TO220
                                            0094
V133082
V133084
              Q ACC HTSNK
                                 TO92
                                            0060
                                 TO220
                                           N500, N501
V133086
              Q ACC HTSNK
                                           U500
V1340100
              U 7815
                               TO220 P
              U 2990-15 LM
                               TO220 P
                                           U501
V1340131
              U 2940-5 LM
                               TO220 P
                                            U502
V134044
              U 1595
                        MC
                               DIP14 M
                                            U503, U504, U507
V1341070
V1342060
              U 5407
                               DIP14
                                      Μ
                                           U509
                                            U508
V134259
              U 8840
                        DAC
                               DIP24
                                      Ι
              U 80C31BH
                            12MDIP40
                                      Ι
                                            U510
V1372322
              CORE 3.7X 1.2X 3.5
                                            0170
C302108
V3061564
              CHOKE AX NS 1 MH
                                            L501,L505
V306410
              COIL DYN LIN 6630A
                                      00
                                            T503
                                            T504
              TRF DRIV
                       AT4043/ 89
V306701
V306726
              TRF CURR AT4043/ 47
                                            T502
V306800
              X ACC INSUL HC49
                                            0120
```

Order number	Description		Item
V306860	X 12.000000 MHZ		Y500
V311061	D ACC HLDR D3 P1 TS H 6	. 5	0160
C3132531		LP	0080
V3133042	J MNL R MBT P 2 AU		J501, J502
V3133047	J MNL R MBT P 9 AU		J504
V313525	J EUR3C MBS P64 E1C2 S1	.6	J506
V3139133	J DUBX1 MBT P 4 E1AU		J505
V315332	SLDRLUG SCR 1TAG D4.2 L	26	0130
V342168	WIRE AWG24 UL1007 WHI	Y	0036
	W JUMP 0.6 17.78		R538
V3620146	SMP-I M2.5X10 D 84		0140
V3620196	SMP-I AM3 X 4 D 84		0150
V3620206	SMP-I AM3 X 5 D 84		0037
V3620216	SMP-I AM3 X 6 D 84		0038,0090
V3620226	SMP-I AM3 X 8 D 84		0091
V3620246	SMP-I AM 3X12 D84		0092
V3661026	NUT DIN934 I M3		0095
V3661106	NUT DIN934 I M2.5		0142
V3673896	WASHER INOX M2.5DIN137	Y	0141
V3673906	WASHER CRINKLE I M3		0039,0093,0151
V367650	MOUNTING BRACKET		0031
V5681921	SOFT DEFL.47/93KC 9600	00	U511
V6030963	CAPTIVE SCREW SPRING	01	0033
V6030964	CAPTIVE SCREW M3 X10	00	0032
V603569	KLEM TRANSISTOR 3L	00	0040
V6035692	KLEMTRANSISTOR 2L	00	0050
V6036112		03	0030
V603695	ISOLATION DEFLECTION	01	0035
V603731	PCB CLAMP MPRD9000	01	0152
C671005	CH 9.2 MH	00	L504
V681019	SMD DEFLECT. MPRD 9600	10	0010
V716543	PCB TESTPOINT	05	0020
V775040	COIL WH-RED-BLA-BLA	**	L502
V775332	T DRIVER DEFL 9000	00	T500
V775333	T SHIFT DEFL 9000	00	T501
V775335	CHOKE POWER DEFL. 9000	00	L500,L503

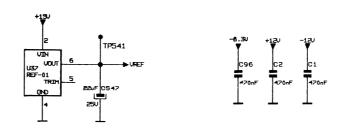
Order number of a complete SMD DEFL: V681019 Date

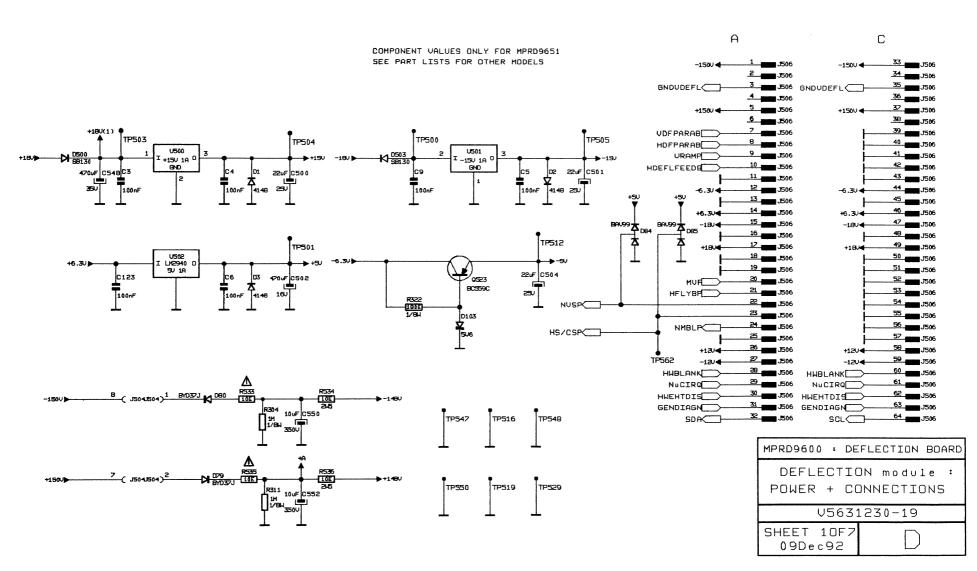
Order number	Description	Item
P200001	R# CE H 1E J 0W12 1206	R321
P200005	R# CE H 1E5 J 0W12 1206	R25
P200043	R# CE H 56E J 0W12 1206	R14 ,R309,R34
P200045	R# CE H 68E J 0W12 1206	R26 ,R283,R284,R33
P200049	R# CE H100E J 0W12 1206	R154,R163,R231,R237,R299,R318
P200053	R# CE H150E J 0W12 1206	R316
P200055	R# CE H180E J 0W12 1206	R322
P200057	R# CE H220E J 0W12 1206	R109, R288, R85
P200059	R# CE H270E J 0W12 1206	R3 , R6
P200061	R# CE H330E J 0W12 1206	R141,R306,R310
P200065	R# CE H470E J 0W12 1206	R1 ,R2 ,R218,R271,R72 ,R75
P200069	R# CE H680E J 0W12 1206	R314,R315
P200073	R# CE H 1K J 0W12 1206	R105, R113, R121, R138, R144, R145,
		R158, R159, R176, R177, R181, R182,
		R184,R198,R202,R208,R213,R216,
		R239, R256, R266, R282, R294, R305,
		R312,R323,R81 ,R82 ,R83 ,R88 ,
		R97 ,R98
P200075	R# CE H 1K2 J 0W12 1206	R117,R125
P200077	R# CE H 1K5 J 0W12 1206	R129, R164, R225
P200079	R# CE H 1K8 J 0W12 1206	R107,R108,R180,R262,R279,R286,
		R303
P200081	R# CE H 2K2 J 0W12 1206	R101,R118,R123,R130,R19 ,R24 ,
		R241,R25 ,R31 ,R324,R39 ,R45 ,
		R51 , R84
P200085	R# CE H 3K3 J 0W12 1206	R106,R126,R143,R179,R194,R217,
D200007	D# OF H 320 T 0513 1306	R269,R285,R78 ,R91
P200087	R# CE H 3K9 J 0W12 1206	R142,R195
P200089	R# CE H 4K7 J 0W12 1206	R161,R221,R258,R273,R28 ,R30 ,
		R325,R35 ,R37 ,R47 ,R48 ,R63 , R65 ,R68
P200091	R# CE H 5K6 J 0W12 1206	
P200091 P200093	R# CE H 6K8 J 0W12 1206	R260,R4 ,R7 ,R87 R148,R38 ,R44
P200095	R# CE H 8K2 J 0W12 1206	R131,R190,R36 ,R42 ,R69 ,R73
P200097	R# CE H 10K J 0W12 1206	R104,R110,R112,R114,R119,R127,
1200057	R# CE II 10R 5 0WIZ 1200	R132,R155,R171,R173,R174,R178,
		R185,R188,R189,R196,R197,R200,
		R201,R207,R214,R219,R270,R278,
		R290,R291,R298,R320,R71 ,R77 ,
		R93 , R94
P200099	R# CE H 12K J 0W12 1206	R111,R15 ,R17 ,R56
P200101	R# CE H 15K J 0W12 1206	R255, R261, R95
P200103	R# CE H 18K J 0W12 1206	R76 ,R96
P200105	R# CE H 22K J 0W12 1206	R115,R204,R210
P200107	R# CE H 27K J 0W12 1206	R226
P200109	R# CE H 33K J 0W12 1206	R135,R156,R20 ,R209,R21 ,R23 ,
		R234,R27 ,R272,R277,R287,R29 ,
		R317,R32 ,R41 ,R52 ,R61 ,R64
P200113	R# CE H 47K J 0W12 1206	R120,R136,R238,R244,R254
P200117	R# CE H 68K J 0W12 1206	R137,R170,R281,R80
P200121	R# CE H100K J 0W12 1206	R10 ,R133,R140,R147,R151,R203,
		R229,R246,R250,R319,R40, R86
P200123	R# CE H120K J 0W12 1206	R152
P200125	R# CE H150K J 0W12 1206	R183,R295
P200127	R# CE H180K J 0W12 1206	R252,R9

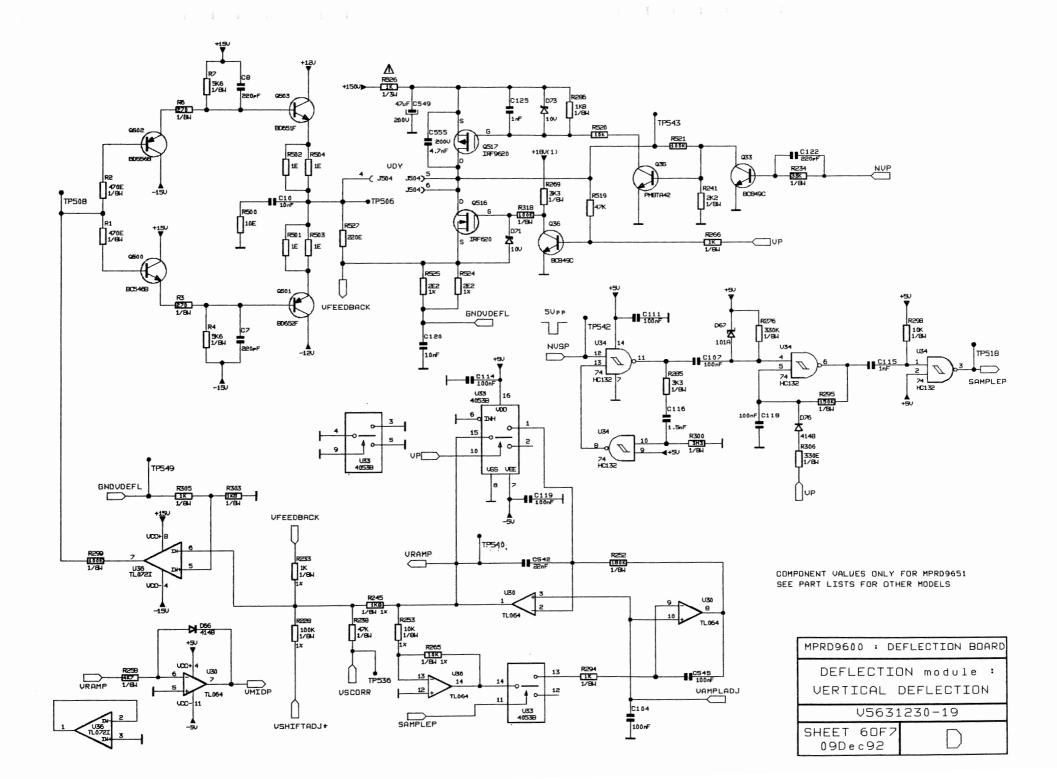
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Order number Description
                                             Item
                                            R276,R54 ,R79 ,R8
P200133
              R# CE H330K J 0W12 1206
                                            R11 ,R211,R212,R274,R289,R301,
              R# CE H560K J 0W12 1206
P200139
                                             R302, R307, R308
                                             R124, R153, R165, R247, R304, R311,
P200145
              R# CE H 1M J 0W12 1206
                                             R74
                                             R236, R300
P200157
              R# CE H 3M3 J 0W12 1206
                       1K F 0W12 1206
                                             R160, R233, R59
P200411
              R# CE H
                        1K2 F 0W12 1206
                                            R50
P200413
              R# CE H
                                            R67
P200415
              R# CE H
                        1K5 F 0W12 1206
                       1K8 F 0W12 1206
                                            R245
P200417
              R# CE H
                                            R13 ,R16 ,R175,R22 ,R43 ,R53 ,
P200423
              R# CE H 3K3 F 0W12 1206
                                            R232, R242, R249, R251, R257, R263,
              R# CE H 4K7 F 0W12 1206
P200427
                                             R267, R275, R280
                                            R102,R103,R12 ,R157,R172,R18 ,
              R# CE H 10K F 0W12 1206
P200435
                                            R253, R265, R46 , R49 , R57 , R58 ,
                                            R62 ,R66 ,R70 ,R90
P200437
              R# CE H 12K F 0W12 1206
                                            R313
              R# CE H 15K F 0W12 1206
                                            R166
P200439
              R# CE H 22K
                           F 0W12 1206
                                            R193, R89 , R92
P200443
P200445
              R# CE H 27K
                           F 0W12 1206
                                            R169
                           F 0W12 1206
                                            R264
P200449
              R# CE H 39K
P200451
              R# CE H 47K
                           F 0W12 1206
                                            R167, R168, R186, R187, R191, R215,
                                            R223, R224, R235, R243, R248
              R# CE H100K F 0W12 1206
                                            R150, R228
P200459
                                            R192, R199
              R# CE H150K F 0W12 1206
P200463
P200469
              R# CE H270K
                           F 0W12 1206
                                            R149
              R# CE H470K F 0W12 1206
                                            R139
P200475
              R# CE H560K F 0W12 1206
                                            R146
P200477
P210002
              C(S)CEC2CH1812X7R474M 50
                                             C1 ,C109,C112,C2 ,C33 ,C46 ,
                                             C63 ,C77 ,C84 ,C94 ,C96 ,C97
                                            C115,C121,C125,C34 ,C39 ,C47 ,
              C(S)CEC1CH1206COG102J 50
P210013
                                             C82
                                            C116, C126, C99
P210028
              C(S)CEC1CH1206COG152J 50
                                            C91
P210045
              C(S)CEC2CH1206X7R473K 50
                                            C36 ,C53 ,C62 ,C70 ,C72 ,C76
P210049
              C(S)CEC2CH1808X7R224K 50
P210068
              C(S)CEC2CH1206X7R223K 50
                                            C27
                                             C122,C13 ,C15 ,C16 ,C37 ,C55 ,
P210076
              C(S)CEC1CH1206COG221J 50
                                             C7 ,C8
P210092
              C(S)CEC2CH1206X7R103K 50
                                             C10 ,C101,C102,C103,C120,C43 ,
                                             C54 ,C56 ,C60 ,C65 ,C66 ,C80
P210095
              C(S)CEC2CH1812X7R334M 50
                                             C79
              C(S)CEC1CH1206COG470J 50
                                            C105, C113, C74
P210100
P210102
              C(S)CEC1CH1206COG471J 50
                                             C44 , C98
                                             C100, C104, C106, C107, C108, C11,
P210122
              C(S)CEC2CH1206X7R104K 50
                                             C110, C111, C114, C117, C118, C119,
                                             C12 ,C123,C127,C17 ,C19 ,C20 ,
                                             C21 ,C22 ,C23 ,C24 ,C26 ,C28 ,
                                             c29 ,c3 ,c30 ,c31 ,c32 ,c35 ,
                                             C4 ,C40 ,C41 ,C42 ,C45 ,C48 ,
                                             C49 ,C5 ,C51 ,C52 ,C565,C57 ,
                                             C6 ,C64 ,C67 ,C68 ,C75 ,C78 ,
                                             C81 ,C85 ,C86 ,C87 ,C88 ,C89 ,
                                             C9 ,C90 ,C92 ,C93 ,C95
              C(S)CEC1CH1206COG101J 50
                                             R230
P210137
P210150
              C(S)CEC2CH1206X7R332K 50
                                             C59
P210156
              C(S)CEC2CH1206X7R682J 50
                                             C18
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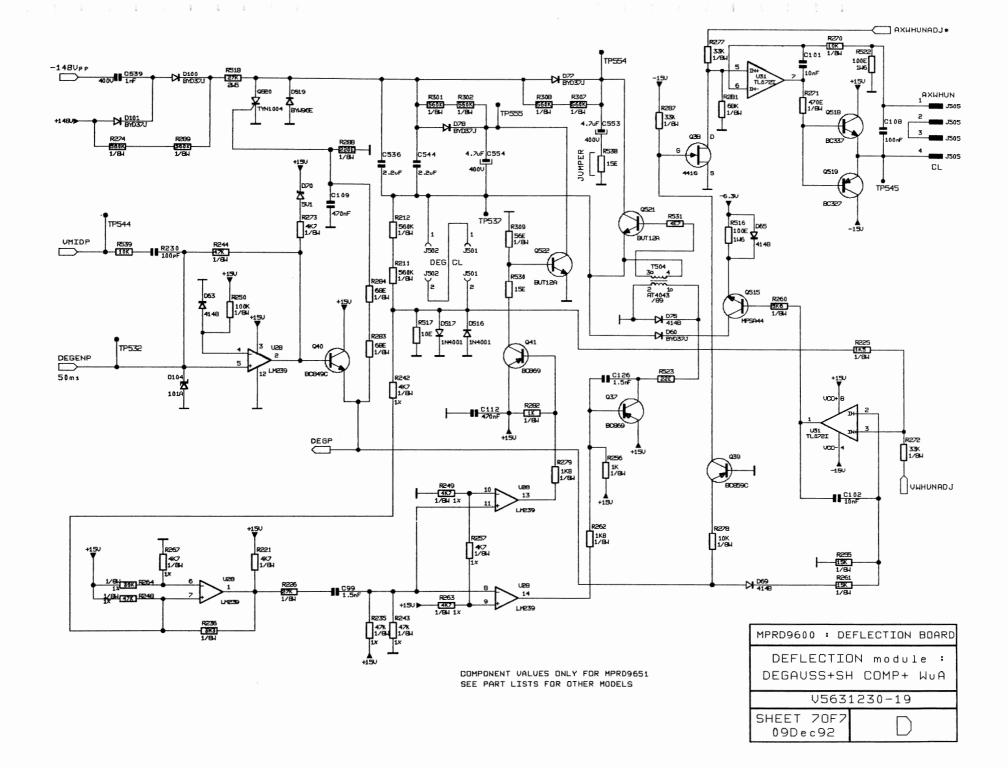
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Order number Description
                                            Item
P210161
              C(S)CEC1CH1206COG121J 50
                                            C38
P210238
              C# N750MU 15P J 63 1206
                                            C61
P230030
              SMC(S)ICCMOS
                                4053
                                            U33 ,U8
P230049
              SMC(S)ICCMOS
                              74HC10
                                            U29
P230052
              SMC(S)ICCMOS
                              74HC74
                                            U13
P230054
              SMC(S)ICLOPA
                                            U12 ,U14 ,U17 ,U27 ,U3 ,U31 ,
                               TL072I
                                            U36 ,U4 ,U7 ,U9
P230058
              SMC(S)ICLCOM
                                LM239
                                            U22 ,U28
P230094
                                            U16
              SMC(S)ICCMOS
                                 4067
P230139
              SMC(S)ICDMOS 74HC4016
                                            U11
P230163
              SMC(S)ICDMOS
                             74HC132
                                            U34
P230173
              SMC(S)ICDMOS
                              74HC14
                                            U6
P230328
              SMC(S)ICLQUA
                              TL064I
                                            U19 ,U20 ,U21 ,U25 ,U30
P230378
              SMC(S)ICTIM MB3773
                                    SOF8
                                            U32
P230450
              SMC(S)ICHC 74HC4020 S016
                                            U10
P230464
              SMC(S)ICHCT74HCT574 SOL20
                                            U24 ,U26
P230515
              SMC(S)ICHCT74HCT373 SOL20
                                            U23
P230568
              SMC(S)ICHC 74HC4002 SO14
                                            IJ1
              SMC(S)ICHC 74HC4046 SO16
P230569
                                            U5
P230570
              SMC(S)ICHC 74HC4518 S016
                                            U2
P230583
              SMC(S)ICCOM LM293
                                     SO8
                                            U15 ,U18
P230641
              SMC(S)ICREF REF01
                                     S08
                                            U37
P232004
              SMC(S)TRA
                               BC849C
                                            Q10 ,Q11 ,Q15 ,Q22 ,Q23 ,Q27 ,
                                            Q28 ,Q29 ,Q30 ,Q33 ,Q34 ,Q36 ,
                                            Q4 ,Q40 ,Q5 ,Q7
P232019
              SMC(S)TRAFET
                                            038
                                 4416
P232069
              SMC(S)TRA
                               BT2369
                                            Q1 ,Q12 ,Q13 ,Q14 ,Q2 ,Q6 ,
                                            Q9
P232101
              SMC(S)TRPNP BC859C SOT23
                                            Q17 ,Q18 ,Q26 ,Q3 ,Q39 ,Q42
P232126
              SMC(S)TRNPN PMBTA42 SOT23
                                            Q20 ,Q24 ,Q35
P232127
              SMC(S)TRPNP PMBTA92 SOT23
                                            Q19 ,Q25
                                            Q21 ,Q37 ,Q41
P232129
              SMC(S)TRPNP BC869
                                  SOT89
P234036
              SMC(S)DIOZEN BZX84B5V6
                                            D103, D34
P234047
              SMC(S)DIO
                                            D82 ,D83 ,D84 ,D85
                                BAV99
P234048
              SMC(S)DIOZEN BZX84C15
                                            D33 , D42
P234074
              SMC(S)DIOZEN BZX84C10
                                            D46 ,D6 ,D71 ,D73
              SMC(S)DIOZEN BZX84C6V8
P234094
                                            D14
P234099
              SMC(S)DIO
                                 4148
                                            D1 ,D10 ,D13 ,D15 ,D16 ,D17 ,
                                            D18 ,D2 ,D20 ,D21 ,D23 ,D24 ,
                                            D3 ,D30 ,D31 ,D32 ,D36 ,D37
                                            D38 ,D4 ,D40 ,D41 ,D44 ,D45 ,
                                                     ,D51 ,D52 ,D54 ,D55 ,
                                            D48 ,D5
                                            D57 ,D58 ,D59 ,D63 ,D65 ,D66 ,
                                            D69 ,D75 ,D76 ,D86 ,D87 ,D88
                                            D102,D11 ,D22 ,D29 ,D43 ,D47 ,
P234140
              SMC(S)DIOSCH
                              LL101A
                                            D53 ,D67 ,D8 ,D81, D104
P234172
              SMC(S)DIZENBZX84B5V1SOT23
                                            D28 ,D50 ,D70
P234196
              SMC(S)DIAVA BYD37J SOD87
                                            D100, D101, D60 , D68 , D77 , D78 ,
                                            D79 ,D80
P900809
              PRINT - P1286809
                                            S
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2.2.6 SCHEMATIC DIAGRAM









2.2.7 BACKBOARD CONNECTIONS

DEFLECTION Board Connector J506 is connected with BACKBOARD Connector J12.

a-side	signal				c-side	signal		_
pin nr	name	to	from	L	pin nr	name	to	from
				(CAD)_				
1	-150 V		P	33	1	-150 V		P
2	nc/ntbu			34	2	nc/ntbu		
3	GNDVDEFL		P	35	3	GNDVDEFL		P
4	nc/ntbu			36	4	ncIntbu		
5	+150 V		P	37	5	+150 V		P
6	nc/ntbu			38	6	nc/ntbu		
7	VDFPARAB	E		39	7	GND		P
8	HDFPARAB	E		40	8	GND		P
9	VRAMP	DXI		41	9	GND		P
10	HDEFLFEEDB	DX0		42	10	GND		P
11	GND		P	43	11	GND		P
12	-6.3 V		P	44	12	-6.3 V		P
13	GND		P	45	13	GND		P
14	+6.3 V	i	P	46	14	+6.3 V		P
15	-18 V		P	47	15	-18 V		P
16	GND		P	48	16	GND		P
17	+18 V		P	49	17	+18 V		P
18	GND		₽	50	18	GND		P
19	GND		P	51	19	GND		P
20	MVP	ACM		52	20	GND		P
21	HFLYBP	AGM		53	21	GND		P
22	NVSP		A	54	22	GND		P
23	HS/CSP			55	23	GND		P
24	NMBLP		G	56	24	GND		P
25	GND		P	57	25	GND		P
26	+12 V		P	58	26	+12 V		P
27	-12 V		P	59	27	-12 V		P
28	HWBLANK	G		60	28	HWBLANK	G	
29	NuCIRQ int	G		61	29	NuCIRQ int	G	
30	HWEHTDIS	G		62	30	HWEHTDIS	G	
31	GENDIAGN oc/int	G	abilmo	63	31	GENDIAGN oc/int	G	<u> AEILMO</u>
32	SDA	CILMO	CILMO	64	32	SCL		G

2.2.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

DEFL. BOARD WATERCOOLED MPRD9651 V5631231

Order number of a complete DEFL. BOARD WATECOOLED MPRD9651: V5631231 19 Date: 12/01/93 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFL. BOARD WATERCOOLED MPRD9651 V5631231 19

SUBSTITUTES

Order Number	Description	Item
V6036112	HEATSINK DEFL 20H 03	0030 replaced by
V6036111	HEATSINK DEFL. FLAT 02	

DEFLECTION BOARD 32/64 KC MPRD9651 V5631232

Order number of a complete DEFLEC. BOARD 32/64 KC MPRD9651: V5631232 14 Date: 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFLEC. BOARD 32/64 KC MPRD9651 V5631232 14

SUBSTITUTES

Order Number	Description	Item
V114040	C POMERA 68N K250E4	C505 replaced by
V1150682	C PPMERA 220N K250E6	
V1150662	C PPMERA 150N K250E6	C506 replaced by
V1150712	C PPMERA 390N K250E9	
V1150692	C PPMERA 270N K250E9	C507 replaced by
V1150742	C PPMERA 680N K250E9	
V1150732	C PPMERA 560N K250E9	C508 replaced by
V1150782	C PPMERA 1M5K250E11	
V1150692	C PPMERA 270N K250E9	C509 replaced by
V1150742	C PPMERA 680N K250E9	
V115162	C PP RA 1N5J100E2	C558 replaced by
V115163	C PP RA 2N2J100E2	
V1127030	C X7R MU 100N K200E2	C562 replaced by
V1127020	C X7R MU 10N K200E2	
V7750 4 0	COIL WH-RED-BLA-BLA	L502 replaced by
V775039	COIL WH-YEL-BLA-BLA	
V5681921	SOFT DEFL.47/93KC 9600 00	U511 replaced by
V5681931	SOFT DEFL.32/64KC 9600 00	
ADDED		
Order Number	Description	Item
V101223	R MF H 82E J 0W5	R540

DEFLECTION BOARD 40/80 KC MPRD9643 V5631237

Order number of a complete DEFLEC. BOARD 40/80 KC MPRD9643: V5631237 00 Date: 01/12/92 Differences between DEFLEC. BOARD 32/64 KC MPRD9643 V5631235 and DEFLEC. BOARD 40/80 KC MPRD9643: V5631237 00

SUBSTITUTES

Order Number	Description	Item
V1150652	C PPMERA 120N K250E6	C505 replaced by
V1150642	C PPMERA 100N K250E6	
V1150692	C PPMERA 270N K250E9	C506 replaced by
V1150682	C PPMERA 220N K250E6	
V1150722	C PPMERA 470N K250E9	C507 replaced by
V1150712	C PPMERA 390N K250E9	
V1150762	C PPMERA 1M K250E11	C508 replaced by
V1150752	C PPMERA 820N K250E11	
V1150712	C PPMERA 390N K250E9	C509 replaced by
V1150702	C PPMERA 330N K250E9	
V1127020	C X7R MU 10N K200E2	C562 replaced by
V1127030	C X7R MU 100N K200E2	
V775039	COIL WH-YEL-BLA-BLA	L502 replaced by
V775040	COIL WH-RED-BLA-BLA	
V5681921	SOFT DEFL.47/93KC 9600 00	U511 replaced by
V5681931	SOFT DEFL.32/64KC 9600 00	
ADDED		
ADDED		
Order Number	Description	Item
V2000007	=	_ 0 0

REMOVED

Item

R540

DEFLECTION BOARD 47/94 KC MPRD9651 V5631238

Order number of a complete DEFLEC. BOARD 47/94 KC HEATS. MPRD9651: V5631238 00 Date: 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFLEC. BOARD 47/94 KC HEATS. MPRD9651: V5631238 00

SUBSTITUTES

Order Number	Description		Item	
V6036112 V6036114	HEATSINK DEFL 20 H HEATSINK DEFL 20-10X45H	03 03	0030	replaced by

DEFLECTION BOARD 47/94 KC SHRT FLB 9651 V5631239

Order number of a complete DEFLEC. BOARD 47/94 KC SHRT FLB. $9651:V5631238\:00$ Date : 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFLEC. BOARD 47/94 KC SHRT FLB. $9651:V5631230\:00$

SUBSTITUTES

Order Number Description Item

V115006 C PPMERA 12N J102 E9 HV C513, C518 replaced by

V115003 C PPMERA 10N J102 E9 HV

DEFLECTION BOARD 47/94 KC FC722 MPRD9651 V5631930

Order number of a complete DEFL. BOARD 47/94 KC FC722 MPRD9651 : V5631930 00 Date : 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFL. BOARD 47/94 KC FC722 MPRD9651 V5631930 00

ADDED

Order Number Description Item

V395154 FLUORAD FC - 722 0200

DEFLECTION BOARD 47/94 KC H.SEAL MPRD9651 V5631931

Order number of a complete DEFL. BOARD 47/94 KC H.SEAL MPRD9651: V5631931 00 Date: 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFL. BOARD 47/94 KC H.SEAL MPRD9651 V5631931 00

ADDED

Order Number Description Item

V395166 HUMISEAL 1B31 0200

DEFLECTION BOARD 32/64 KC FC722 MPRD9651 V5631932

Order number of a complete DEFLEC. BOARD 32/64 FC722 MPRD9651 : V5631932 00 Date : 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFLEC. BOARD 32/64 FC722 MPRD9651 V5631932 00

SUBSTITUTES

Order Number	Description	Item
V114040	C POMERA 68N K250E4	C505 replaced by
V1150682	C PPMERA 220N K250E6	
V1150662	C PPMERA 150N K250E6	C506 replaced by
V1150712	C PPMERA 390N K250E9	
V1150692	C PPMERA 270N K250E9	C507 replaced by
V1150742	C PPMERA 680N K250E9	
V1150732	C PPMERA 560N K250E9	C508 replaced by
V1150782	C PPMERA 1M5K250E11	
V1150692	C PPMERA 270N K250E9	C509 replaced by
V1150742	C PPMERA 680N K250E9	
V115162	C PP RA 1N5J100E2	C558 replaced by
V115163	C PP RA 2N2J100E2	
V1127030	C X7R MU 100N K200E2	C562 replaced by
V1127020	C X7R MU 10N K200E2	
V775040	COIL WH-RED-BLA-BLA	L502 replaced by
V775039	COIL WH-YEL-BLA-BLA	
V5681921	SOFT DEFL.47/93KC 9600 00	U511 replaced by
V5681931	SOFT DEFL.32/64KC 9600 00	

ADDED

Order Number	Description	Item
V101223	R MF H 82E J 0W5	R540
V395154	FLUORAD FC - 722	0200

DEFLECTION BOARD CER FC722 MPRD9651 V5631933

Order number of a complete DEFLEC. BOARD CER FC722 MPRD9651: V5631933 00 Date: 01/12/92 Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and DEFLEC. BOARD CER FC722 MPRD9651 V5631933 00

SUBSTITUTES

Order Number	Description	Item
V134259	U 8840 DAC DIP24 I	U508 replaced by
V1342591	U 8840 DAC DIP24 C	
V1372322	U 80C31BH 12MDIP40 I	U510 replaced by
V1372323	U 80C31BH TD 12MDIP40 C	
V5681921	SOFT DEFL.47/93KC 9600 00	U511 replaced by
V5681911	SOFT DEFLECT.MPRD 9600 00	U511

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

2.3 EHT BOARD

General

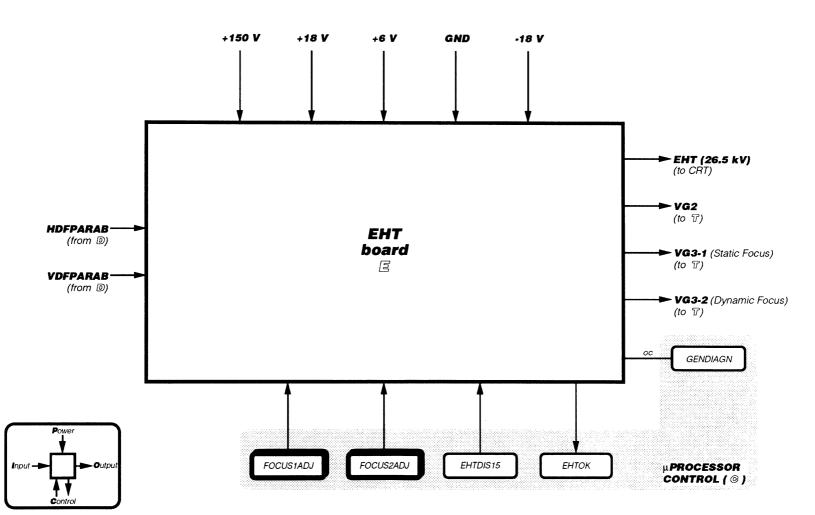
The EHT board generates the EHT, VG2 and the FOCUS voltage for horizontal & vertical dynamic focus and static focus. It contains a high efficiency pulse-width modulated power oscillator.

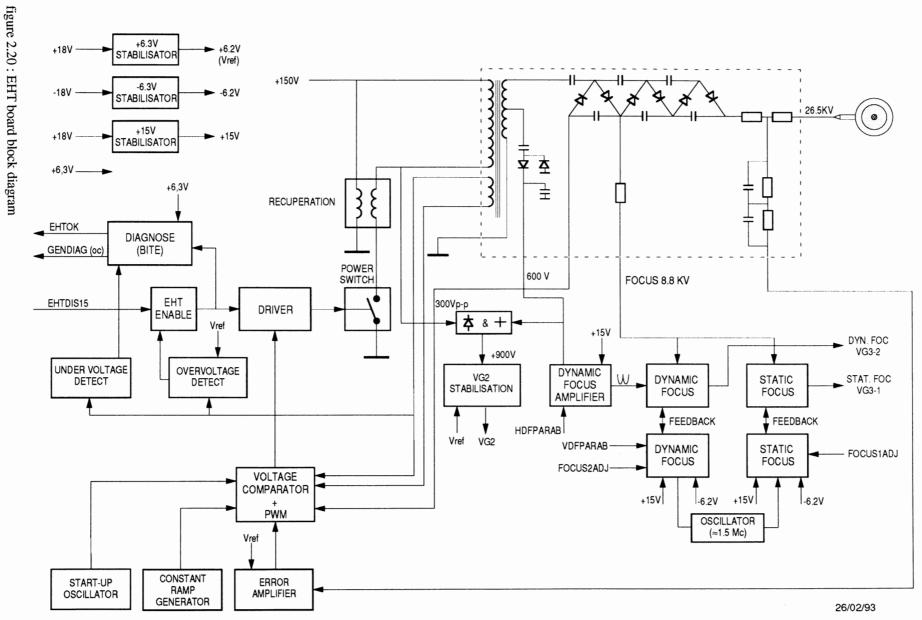
Static and dynamic horizontal & vertical FOCUS are DC adjustable, no high voltage trimmers are required. All necessary circuits for diagnose and protection are implemented.

Optional EHT board versions are described in section 2.3.8 Customized Versions (Options)

figure 2.19: EHT board IOPC diagram

MPRD 9600 EHT board ☐ 27 01 92





2.3.3 CIRCUIT DESCRIPTION

EHT GENERATOR

The primary (EHT module, pin10,11) of the EHT transformer is part of an oscillator, and acts as a tuned circuit (fres. approx. 60 Kc). The oscillator is powered by the +150 V, the EHT feedback signal (EHT module, pin5,7) is pulse width modulated to regulate the amplitude of the EHT.

Start-up

Shortly after power up, no EHT will be present. A built-in sine wave oscillator U6,pin1,2,3, C14, RA5,6 with a frequency close to the self resonance frequency of the EHT module will start the EHT generator. The sine wave is connected to the inverting input U4,pin4 of a comparator via R8, the non-inverting input is connected to VREF (6,3Vdc). The sine wave is converted into a square wave and leaves at U4,pin2. A constant current source Q5,D1,2,R1,15 charges C9. When U4,pin2 goes low, C9 will be discharged via R9,D3.

Once the EHT generation has started, the oscillator voltage (coupled via $R8 = 220 \text{K}\Omega$) will be overruled by the voltage at pin5,7 (coupled via R13,14 = 470 Ω) of the EHT module; the discharging of C9 is now locked with the oscillator frequency.

EHT Feedback & Stabilisation

The overcompensated EHT feedback signal leaves the EHT module at pin2, assuming that Q6 is on, a small part of it will be found across R17, smoothed by C17. Via R19 it is connected to the inverting input U6,pin6 of an integrator (U6,R24,C12,13), the non-inverting input receives part of VREF (P1,R31). At the output of the inverter U6,pin7 leaves a varying positive DC-signal. It is compared with the ramp at U4,pin6; as soon as the level of the ramp exceeds the outputlevel of the integrator, U4,pin1 goes low. Q4 will be turned off via Q2 and R2. Little later, C9 will be discharged again; U4, pin 1 will go high, the gate-source capacitor of Q4 will be charged by Q3 via R11,2, D34 limits the gate voltage.

D5 ensures that Q4 can only conduct during the negative half cycle of the sine wave on pin10 of the EHT module.

If EHT increases, the EHT feedbacklevel will increase, the voltage over R17 will increase, the DC-level at U6,pin7 will decrease, it will be exceeded faster by the ramp, turning of Q4 earlier, reducing the pulse width and the EHT; if the EHT feedbacklevel decreases, the opposite will happen.

Power Circuit

Q4 is the power switch, pulse-width modulated driven by U4,pin1 via Q2,3.

When Q4 switches on, a rising current flows through the primary winding of the EHT module (pin10,11) and the primary of L2. The secondary of L2 blocks, D6 is biased in reverse direction.

The insertion of L2 in the primary circuit allows to have a sinusoidal voltage on pin 10 and a near zero voltage on the drain of Q4 (Q4 saturated) simultaneously. When Q4 is switched off, the induction voltage in the secondary of L2 will bias D6 in forward direction. As a result the energy stored in L2 at the end of the conduction time of Q4 will be recycled into the positive power supply. This circuit allows nearly lossless operation in the primary power circuits of the EHT generator (only conduction losses in the saturated Q4, its switching losses at +/- 60 Kc are very small). R4,3, C2,6 damp voltage spikes on Q4 and D6.

EHT Overcurrent Protection

Under normal conditions the current through R10, connected to the +18V, is sufficient to saturate Q6. If the EHT-current exceeds $[18V - 0.7V]/7.86K\Omega$, Q6 will not be saturated any more and Vce of Q6 will increase. This will result in a higher EHT feedbackvoltage (sum of UR17 and Vce Q6); the EHT will decrease and so will the EHT current.

Overvoltage detect

The sinusoidal signal leaving at pin5,7 is also used to check for over- or undervoltage.

It is peak to peak rectified D9,10 and connected to the non inverting input U4,pin9,10 of the comparator.

If the level is higher than VREF, U4,pin14 goes high, via RA7.8 Q1 will conduct, shortening the drivesignal for Q2,3,4 to ground disabling the EHT module, Q8 will be on and led D24 will lighten, via D23 GENDIAGN goes low. D14, RA8 is positive feedback to keep the EHT disabled after overvoltage.

Undervoltage detect

If the level on U4,pin10 is lower than on pin11 the output of the comparator U4,pin13 will go high, Q8 will conduct and led D24 will lighten, via D23 GENDIAGN goes low. As U4,pin14 is low, Q1 will not conduct and the EHT module is not disabled.

Flash protection R69, C42, D40,41 protect U4 against flash, D7,8, R19 protect U6 against flash

VG2 STABILISATION

Approximately 750Vdc is required for VG2. The signal at pin 10 of the EHT module is peak to peak rectified (C39,41 D36,37) and added to the 600V present at pin 15 of the EHT-module.

The 900Vdc is stabilised by a series regulator Q11.

VG2 OUT is sensed over the voltage reducer R50,45 P2 and connected to U9,pin2. The non inverting input receives VREF via R49, the difference between the inputsignals is integrated by U9 and connected to Q9. If VG2 OUT is too low, the voltage at U9,pin1 will increase, the current through Q9 will decrease, the base current of Q11 will increase and VG2 OUT will rise; if VG2 OUT is too high, vice versa. C33 smooths the base drive of Q11, C36 reduces the output impedance, D23,39 protect against flash, R52, C39 determine the loop gain.

HORIZONTAL DYNAMIC FOCUS

The horizontal dynamic focus is powered by the +600Vdc at pin15 of the EHT module. HDFPARAB, coming from the deflection board is coupled capacitively (C559 on the deflection board) to the hor. dyn. focus circuit.

The transistorarray U7, pin1,2,3,4,5,12,13,14 is a differential amplifier; input U7, pin2 receives the signal HDFPARAB, the other input, U7, pin4, receives the attenuated (R57,59,R60,R36//R37) and by an emitterfollower (U7,pin9,10,11) buffered outputsignal.

The current going through the collector of U7,pin14 is determined by the voltage over D19 and R35.

The current through the base of Q10, connected to the +15V via D25, is determined by the voltage across R44, via the emitter of U7 current is injected in R44, driving the outputstage Q10,12.

The outputstage is a bootstrapped active load amplifier to reduce powerdisspation. The quiescent current is determined by R55,56. Via C34,R58 the outputsignal is driving the base of Q12, D30 allows to drive Q12 exceeding the 600V power supply.

When a high outputlevel is required, Q12 will be driven additionally via C34,R58 as soon as the outputlevel starts to rise; via feedback the voltage across R44 will increase and Q10 will hardly conduct. The capacitive load can now be charged via the low-impedance emitter path of Q12.

Discharging the capacitive load goes via 42,Q10 (common base reduces influence of Miller capacitor),R44, due to feedback very short output signal fall times are obtained.

The outputsignal of the horizontal dynamic focus is capacitively coupled to VG3-2. To ensure a good flash protection, SG1, R25 and D31,32 were added. D22 protects the b-e junction U7,pin6,7, D18 protects the b-e junction U7,pin2,3.

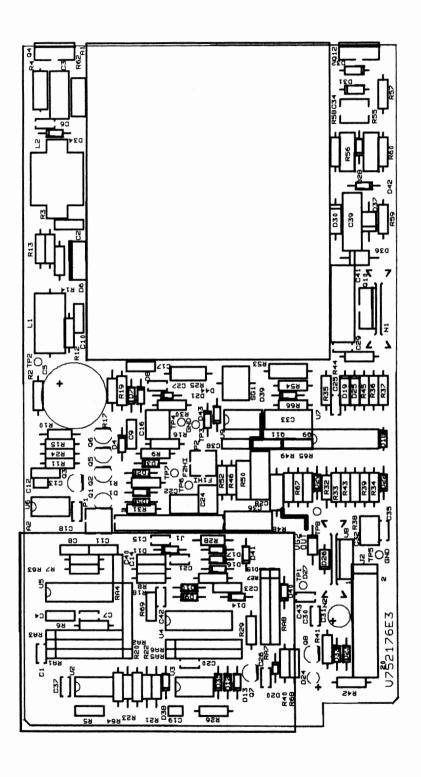


figure 2.21: EHT board component side

2.3.5 PARTSLIST

V1124300

C COG MU

Order number of a complete EHT: V5636240 0.0 Date: 11/05/93 Order number Description Item J 0W5 R2 V101212 R MF H 10E J 0W5 R33 , R38 V101220 R MF H 47E R MF H100E J 0W5 R69 V101224 V101231 R MF H390E J 0W5 R35 MF H470E J 0W5 R13 ,R14 ,R26 ,R63 ,R64 ,R9 V101232 R R44 V101233 R MF H560E J 0W5 R15 V101234 R MF H680E J 0W5 R16 ,R45 ,R49 ,R6 ,R65 ,R67 , V101236 R MF H 1K J 0W5 R7 V101238 R MF H 1K5 J 0W5 R40 , R52 1K8 J 0W5 R24 V101239 MF H R R30 2K2 J 0W5 V101240 R MF H V101242 R MF H 3K3 J 0W5 R27 , R37 R MF H 4K7 J 0W5 R42 V101244 5K6 J 0W5 R11 V101245 R MF H R MF H 6K8 J 0W5 R19 ,R36 ,R39 V101246 R MF H 10K J 0W5 R54 , R58 V101248 V101253 R MF H 27K J 0W5 R46 R41 ,R68 R MF H 47K V101256 J 0W5 V101257 R MF H 56K J 0W5 R31 MF H100K R1 ,R18 ,R66 V101260 R J 0W5 R MF H220K J 0W5 R8 V101264 V101268 R MF H470K J 0W5 R20 R29 V101271 R MF H820K J 0W5 R70 R MF H 47E F 0W4 E2 V101520 V101536 R MF H 1K F 0W4 E2 R34 K 0W5 V102036 R CC H 1K R25 CC H 10K K 0W5 R48 V102048 R R23 , R5 R MF H 10K F 0W6 V1026007 V1026047 R MF H 11K F 0W6 R57 V1026146 R MF H 1K4 F 0W6 R21 V1026298 R MF H200K F 0W6 R17 R28 V1026338 R MF H221K F 0W6 R MF H 3K32F 0W6 R22 V1026506 MF H 5K62F 0W6 R43 V1026726 R V1026756 R MF H 6K04F 0W6 R32 V1026807 MF H 68K1 F 0W6 R59 , R60 R R10 V1026856 R MF H 7K68F 0W6 MF H909E F 0W6 R12 V1026925 R J 1W6 V102916 MF H 22E R4 R R55 , R56 V102960 R MF H100K J 1W2 V104651 HV H680K J 0W5 3500 R53 R 3500 K104668 R HV H 3M9 J 0W5 R50 V104671 R HV H 4M7 J 0W5 3500 R62 R TCE H 10K M 0W5 S7 TS V107009 P1 S7 TS R TCE H 50K M 0W5 V107012 С 47M M200E3 105 C5 V1114005 ELRA C 47M M 25E1 105 C31 V1114762 ELRA ,C33 ,C36 С 10N M102E3 C28 ,C3 V1117581 CE DI ΗV C DI 100P K202E3 HV C34 V1120902 CE С COG MU 560P J100E2 125 С6 V1122360

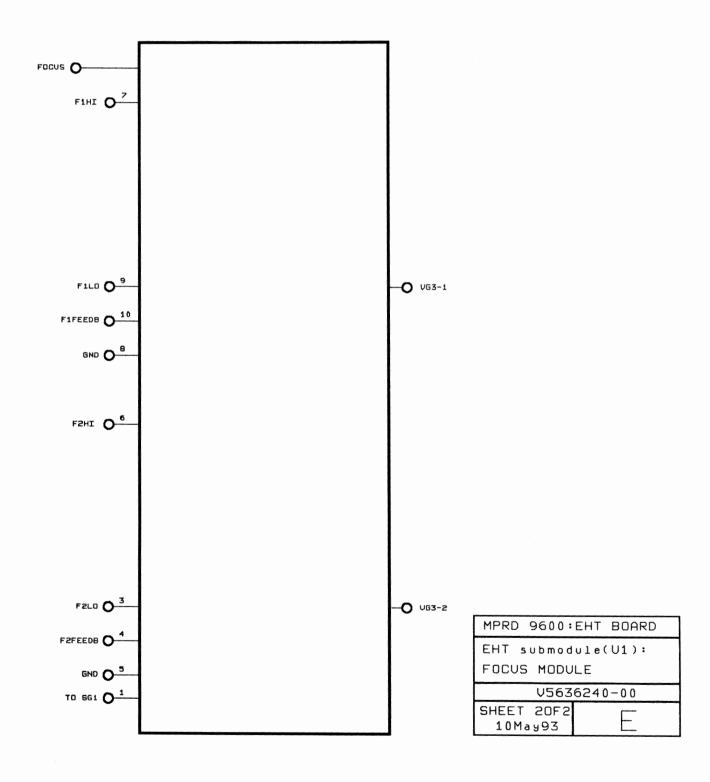
C12

10P J100E1 125

```
Order number Description
                                           Item
V1124410
              C COG MU 82P J100E1 125
                                           C19
V1127410
              C X7R MU
                         1N5K 50E2 125
                                           C44
              C X7R MU 100N K 50E2 125
V1127830
                                           C1 ,C15 ,C18 ,C20 ,C21 ,C25 ,
                                           c26 ,c27 ,c29 ,c30 ,c35 ,c37 ,
                                           C42 , C7
V1140304
              C POMERA 10N K400E4
                                           C39
V1140424
              С
                POMERA 100N K400E6
                                           C41
                                    85
V114080
              С
                 POMERA 10N K 63E2
                                    85
                                           C11 ,C17 ,C23 ,C4
                 POMERA 33N K 63E2
V114083
              C
                                     85
                                           C40
                 POMERA 330N K 63E2
V114091
              С
                                    85
                                           C32
V114092
              C POMERA 470N K 63E2 85
                                           C22 ,C24
V114096
              C POMERA
                          1M K 50E2 85
                                           C16
V114481
              C PO RA
                          1N5M100E2 100
                                           C14 ,C38
              C PO RA
V114482
                          2N2M100E2 100
                                           C8
V114486
              C PO RA
                          6N8M100E2 100
                                           C13
V115183
              C
                PC RA 560P K100E2 100
                                           C10 ,C9
V1312621
              TUBE SURGE PROTECT 1000V
                                           SG1
V131411
              Q BC549C
                                           Q1 ,Q6
                           N SS T092
                                                    , Q8
V1314133
              Q BC557C
                            P SS T092
                                           Q7
V1314182
              Q BC559C
                           P SS T092
                                           Q5
V131426
                            N SS T092
              Q BC337
                                           Q3
V1315046
              D BAT86
                            SCH DO34
                                           D10 , D9
V1316211
              D 1N4148
                             SW DO35
                                           D1 ,D11 ,D12 ,D13 ,D14 ,D15 ,
                                           D16 ,D17 ,D18 ,D2 ,D22 ,D28 ,
                                           D29 ,D3 ,D33 ,D35 ,D38 ,D39 ,
                                              ,D40 ,D41 ,D42 ,D43 ,D44 ,
                                           D5
V131627
                                           D7
                                               , D8
              D BAV21
                              SW DO35
V131645
              D 1N4448
                              SW DO35
                                           D23
C131646
              D 1N4007
                              R D041
                                           D26 , D27
V131662
              D LED D3
                           T RED
                                           D24
              D STB 1V4 0W4 C DO7
C131714
                                           D19 ,D25
V1317205
              D REF
                      6V2 0.01 % DO34
                                           D20 ,D21
V131758
              D ZEN 15V 0W5 C DO35
                                           D34
V1319035
              D BYD33M
                             FSR SOD81
                                           D31 , D32
C131907
              D BY584
                               R SOD61A
                                           D30
                                           D36 ,D37
V131912
              D BYV95C
                             FSR SOD57
V1319531
              D BYR29-800F UFSR SOT186
                                           D6
V132088
              HVPS 27.5 KV
                                     04
                                           Α1
V132089
              HVFS 9000
                                     00
                                           A2
V132134
              U 3046
                                           U7
                        CA
                               DIP14 P
              U 072
V1321942
                        TL
                               DIP8
                                      Ι
                                           U6
                                               , U9
              Q BC327-25
V132501
                            P SS T092
                                           Q2
V132535
              Q BUX87
                            ΝP
                                T0126
                                           Q11 ,Q9
V132588
              Q 2SC3675
                            PΡ
                                TO220
                                           Q10 ,Q12
V132606
              Q IRF843
                           FN P TO220
                                           04
V133005
              Q ACC ISO SIL
                                 TO220
                                           0060
V133039
              SPR L 8
                        D 4
                              D 1.2 K
                                           0800
V133082
              Q ACC ISO BUSH
                                 TO220
                                           0064
V133089
              Q ACC HTSNK
                                 TO220
                                           N1 , N2
V1340051
              U 239
                        LM
                               DIP14 I
                                           U4
V1340100
              U 7815
                               TO220 P
                                           U8
V1341091
              U 555
                        TLC
                               DIP8
                                      Ρ
                                           U3
              U 074
V1341171
                        TL
                               DIP14 I
                                           U5
V1341431
              U 062I
                        TL
                               DIP8
                                           U2
V1508101
              R AI 4 100E G 0W3 SIP8
                                           RA2
V1508103
              R AI 4 10K G 0W3 SIP8
                                           RA1 ,RA3 ,RA6 ,RA8
```

```
Order number Description
                                          Item
V1508184
              R AI 4 180K G 0W3 SIP8
                                          RA4
                                          RA5 ,RA7
              R AI 4 47K G 0W3 SIP8
V1508473
V311061
              D ACC HLDR D3 P1 TS H 6.5
                                          0030
V346991
              SLV SHR D19 /9.5
                                    BLK
                                          0192
V346993
              SLV SHR D 9.5/4.8
                                    BLK
                                          0073,0120
V347035
                                          0072
              SLV SHR D12.7/6 HV BLU
                                          0070
V347037
              SLV SLDR CWT 5
              SLV SHR D 6 /2
C347053
                                          0071
                                    BLK
V348000
              CBL ACC TIE B L 98 W2.5
                                          0130
C348041
              SLV FLX D 6
                                          0150
                                   _{
m THW}
              SLV WTR_H D 9/ 7
V348099
                                   CLR
                                          0191
V3492726
              CORD FLAT P20 100MM
                                   0.0
                                          J2
                                          0090,0100
V3620216
              SCR D84 M 3 X 6
                                   Ι
              SCR D84 M 3 X 8
                                          0023,0061
V3620226
                                   Ι
V3661026
              NUT D934
                        M 3
                                   Ι
                                          0050,0063
V3673906
              WSHR WAVE
                                          0024,0051,0062,0091,0101
                          3.2
                                   Τ
V582054
              MAKROFOL N 0.1 X 34X 55
                                          0110
                                          TP1 ,TP2 ,TP3 ,TP4 ,TP5 ,TP6 ,
V602950
              TESTPIN
                                    00
                                          TP7 , TP8
V6035694
             KLEMTRANSISTOR 1L SHORT01
                                          0093
                                          0020
V6036132
             HEATSINK EHT 20H $$$ 03
V603737
              ISOLATION 15/40 9000 00
                                          0092
V603841
              EHT CONNECTOR 40KV
                                  0.0
                                          0190
V752176
              PCB EHT MODULE
                              9000 02
                                          0010
V775164
              CHOKE AX 0.5 51.0UH
                                    01
                                          L1
V7752821
             TRF EHT MPRD9000
                                    00
                                          L2
```

2.3.6 SCHEMATIC DIAGRAM



2.3.7 BACKBOARD CONNECTIONS

EHT Board Connector J2 is connected with BACKBOARD Connector J5.

pin nr	signal name	to	from
1	GND		P
2	GND		P
3	nc/ntbu		
2 3 4 5 6 7 8 9 10	nc/ntbu		
5	+150 V		P
6	+150 V		P
1 7	nc/ntbu		
8	nc/ntbu		
9	-18 V		P
10	-18 V		P
11	+18 V		P
12	+18 V		P
13	GENDIAGN oc/int	G	ADULMO
14	+6.3 V		P
15	EHTDIS15		G
16	FOCUS2ADJ		G
17	EHTOK	G	
18	FOCUS1ADJ		G
19	HDFPARAB		D
19 20	VDFPARAB		D

2.3.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

EHT BOARD WATERCOOLED 9600 V5636241

Order number of a complete EHT BOARD WATERCOOLED 9600: V5636241 00 Date: 10/05/93

Differences between EHT BOARD 9600 V5636240 and EHT BOARD WATERCOOLED 9600: V5636241 00

SUBSTITUTES

Order Number Description Item

V6036132 HEATSINK EHT 20H \$\$\$ 03 0020 replaced by

V6036131 HEATSINK EHT 20H FLAT 02

EHT BOARD FC722 9600 V5636940

Order number of a complete EHT BOARD FC722 9600 : V5636940 00 Date : 10/05/93

Differences between EHT BOARD 9600 V5636240 and

EHT BOARD FC722 9600: V5636940 00

ADDED

Order Number Description Item V395154 FLUORAD FC - 722 0200

EHT BOARD H. SEAL 9600 V5636941

Order number of a complete EHT BOARD H. SEAL 9600: V5636941 00 Date: 10/05/93

Differences between EHT BOARD 9600 V5636240 and

EHT BOARD H. SEAL 9600: V5636941 00

ADDED

Order Number Description Item V395166 HUMISEAL 1B31 0200

EHT BOARD CER. FC722 9600 V5636943

Order number of a complete EHT BOARD CER. FC722 9600 : V5636943 00 Date : 10/05/93

Differences between EHT BOARD 9600 V5636240 and

EHT BOARD CER. FC722 9600: V5636943 00

SUBSTITUTES

Order Number	Des	script	ion			Iter	n			
V131411	Q E	BC5490	N	SS TO	92	Q1,	Q6,	Q8	replaced	by
V131414	Q E	BC1090	N	SS TO	18					
V1314182	Q B	BC5590	P	SS TO	92	Q5			replaced	by
V131420	Q B	BC1770	N	SS TO	18					
V1341431	U 0	062	TL	DIP8	I	U2			replaced	by
V1321940	U 0	72	TL	DIP8	M					
V1341091	U 5	555	TLC	DIP8	I	U3			replaced	by
V1341090	U 5	555	TLC	DIP8	M					
V1340051	U 2	239	LM	DIP14	I	U4			replaced	by
V1340050	U 1	L39	LM	DIP14	M					
V1341171	U O	74	TL	DIP14	I	U5			replaced	by
V1341170	U 0	74	TL	DIP14	M					
V1321942	U 0	72	TL	DIP8	I	U6,	U9		replaced	by
V1321940	U 0	72	\mathtt{TL}	DIP8	М					
V132134	U 3	3046	CA	DIP14	P	U7			replaced	by
V1321340	U 3	8821	SG	DIP14	M					

ADDED

Order Number	Description	Item
C347053	SLE SHR 6.0 3:1 BLA	Q'5, Q'6
V395154	FLUORAD FC - 722	0200

2.4 PROCESSOR BOARD

General

The processor board is built around the 16 bit 68000 processor, clock frequency is 8 MHz.

On board circuitry:

- Interrupt Interface:

- priority encoder (8 to 3 lines)

- 8 interrupts -> 3 lines (IPL0-2)

- 7 NMI with highest priority

- Address Decoder:

- 2 GALs convert adressbus into chip select signals for memory, PIA,

ACIAs and latches

- Adjust Voltage Generator:

- controlled by 2 latches (2 x 8bit)

- 20 analog adjust voltages, 10 bit DAC, 0 - 10.23V/10 mV resolution

- Memory and Parallel I/O Interface:

- SRAM 2 x 32, 2 x128 or 2 x 512 Kbyte

- E²PROM 2 x 2, 2 x 8 or 2 x 32 Kbyte

- EPROM 2 x 128, 2 x 256, 2 x 512, 2 x 1024 Kbyte

- 1 PIA + 7 latches, 62 bit out / 15 bit in

- Remote Control Interface:

- 2 ACIAs

- remote interface for PC RS232 (REMOTE IN)

RS422-423 (REM AUX)

- InterMonitorBus

RS485 (REMOTE IN & OUT)

- OPTISENSE DATA

RS232, 4800 Baud (CONTROL)

- H & V Blanking Generator:

controlled by Mixed Vertical Pulse and Hor. Flyback Pulse

outputsignals:

- VBLP (vertical blanking pulse, 10 bit resolution)

- HBLP (start/stop circuit, independently adjustable 10 bit

resolution)
- soft blank

- hard blank

- Not Mixed Blanking Pulse

- BIT Generator:

clock generator (48MHz / 3) 16MHz

testpattern

- STDBIT

- CROSSHATCH (RGB switchable)

- WHITE BOX (RGB switchable)

- WHITE FIELD (RGB switchable)

- REF WHITE ADJUSTABLE (650-750mV), not for STDBIT

Optional PROCESSOR board versions are described in section 2.4.8 Customized Versions (Options)

2.4.1 IOPC DIAGRAM

MPRD 9600 PROCESSOR board ©

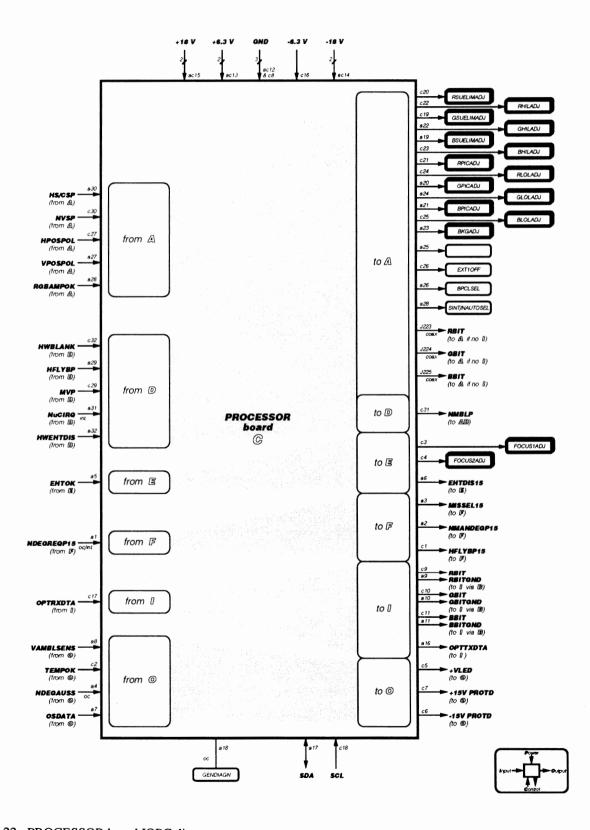


figure 2.22: PROCESSOR board IOPC diagram

MPRD 9600 BIT (Built-In Test) Generator (on ©) 27 01 92

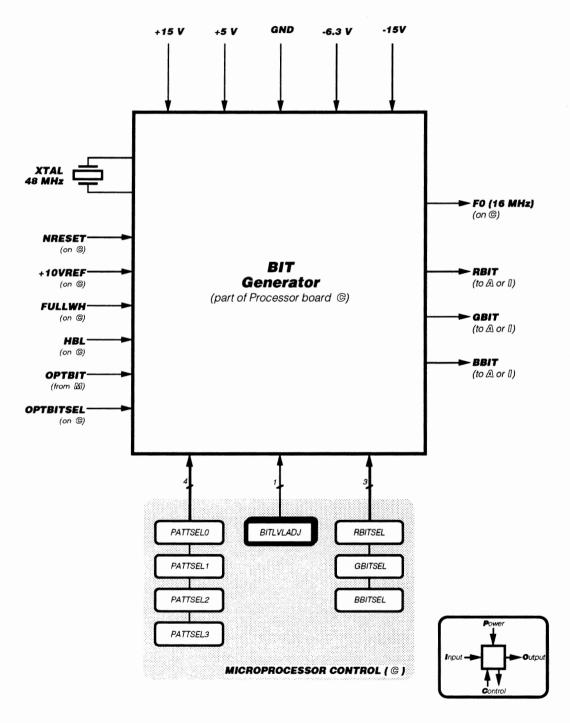
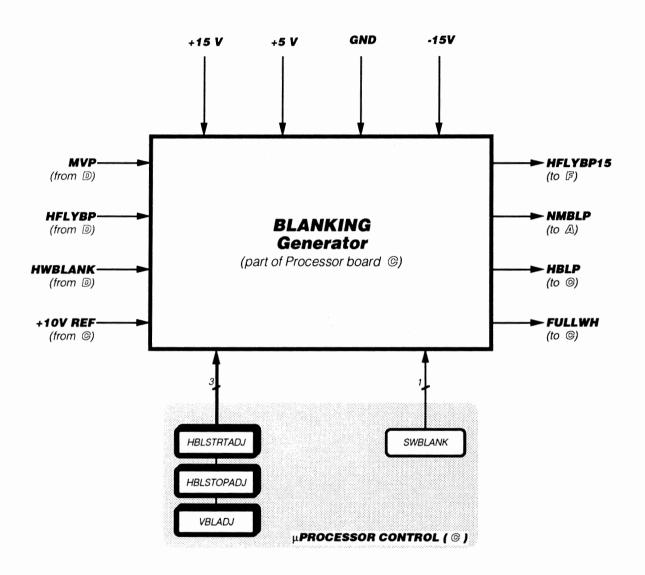


figure 2.23: BIT (Built-In Test) generator IOPC diagram

MPRD 9600 BLANKING Generator (on ©) 27 02 92



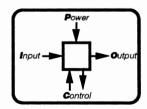


figure 2.24: blanking generator IOPC diagram

MPRD 9600 ADJUST VOLTAGE Generator (on ©) 27 01 92

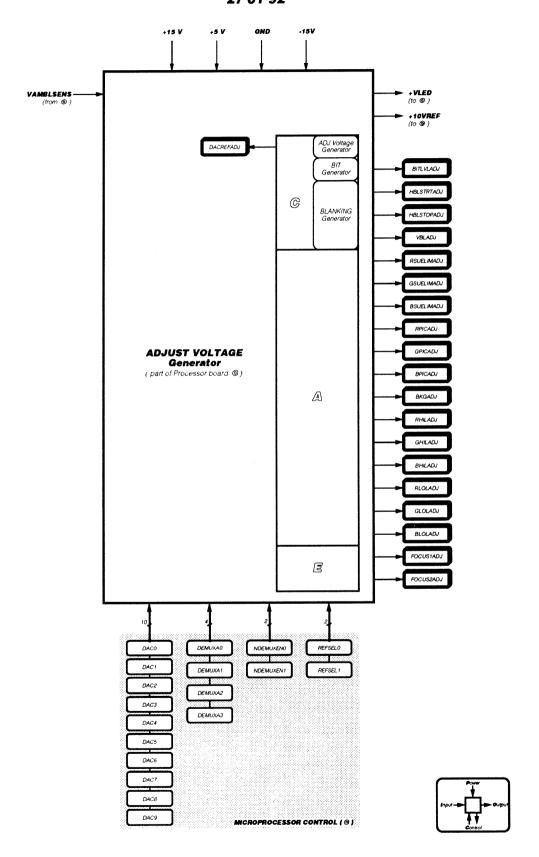


figure 2.25 : adjust voltage generator IOPC diagram

MPRD 9600 CTRL & INFO LINES Interface (on ©) 15 12 92

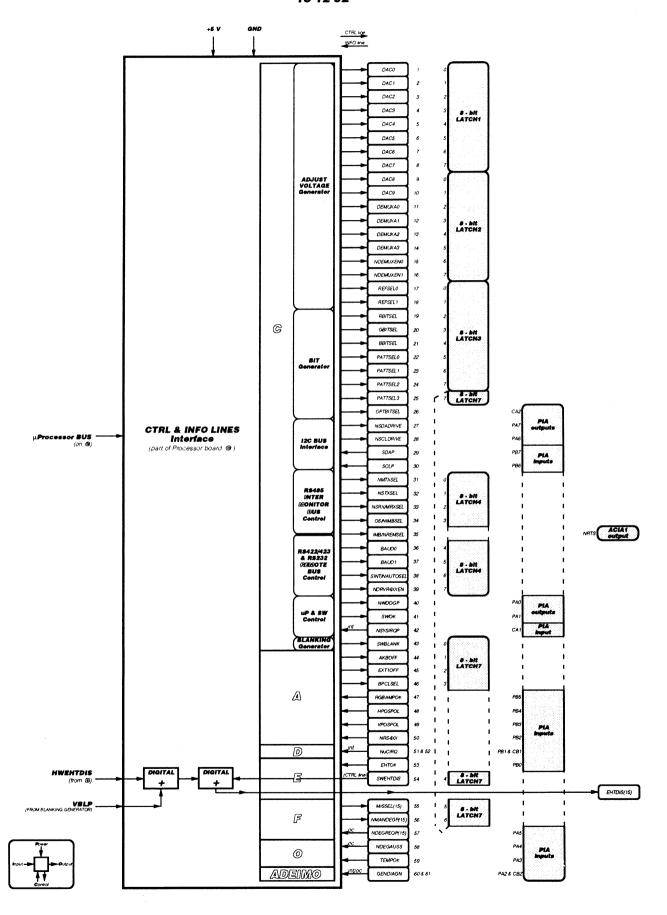
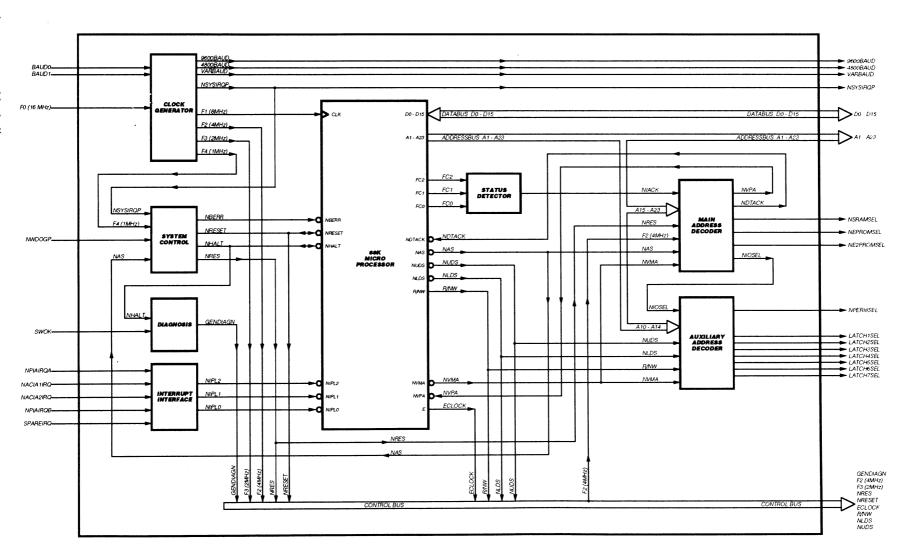


figure 2.26: CTRL & INFO lines interface IOPC diagram

MPRD 9600 68K MICROPROCESSOR (on ©) (part of Processor board) 28 01 92



MPRD 9600 MEMORY & PARALLEL IO (on ©) (part of Processor board) 27 01 92

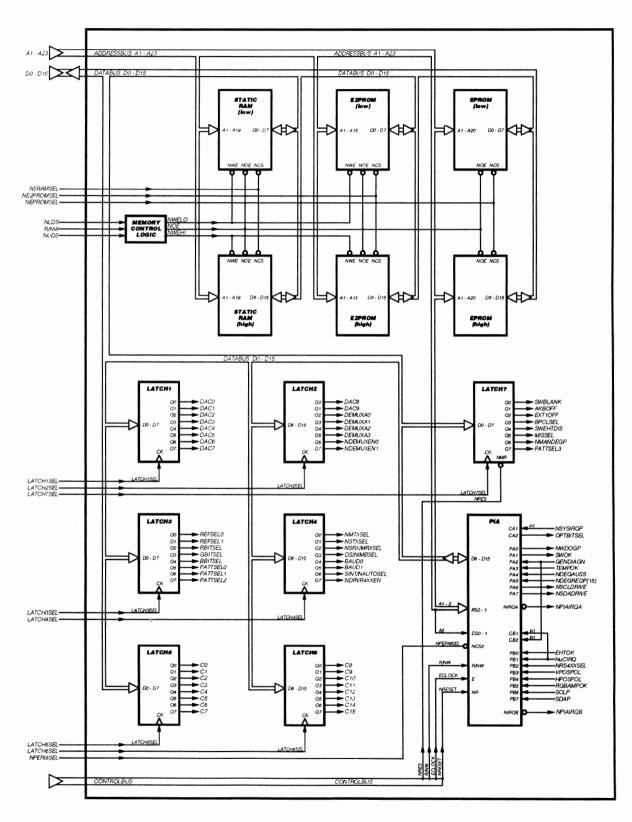


figure 2.28: memory & parallel IO block diagram

MPRD 9600 MICROPROCESSOR Module (©) 28 0792

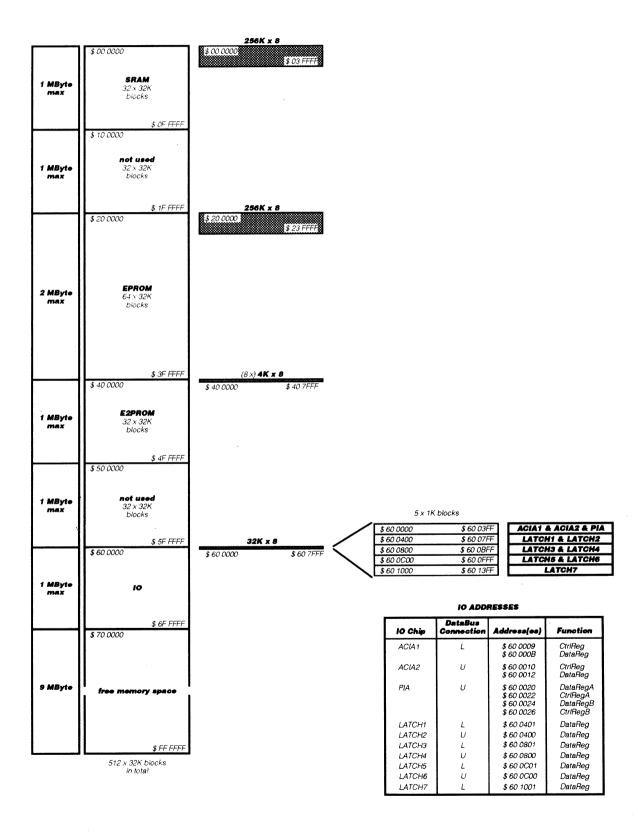
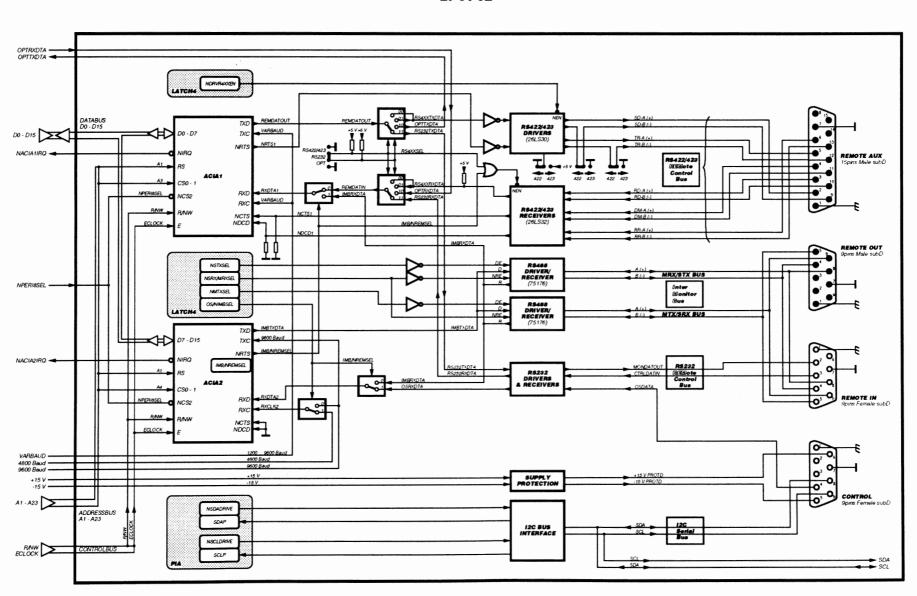


figure 2.29: microprocessor memory map

MPRD 9600 SERIAL REMOTE CONTROL (on ©) 27 01 92



MPRD 9600 BIT (Built-In Test) GENERATOR (on ©) (part of Processor board) 28 01 92

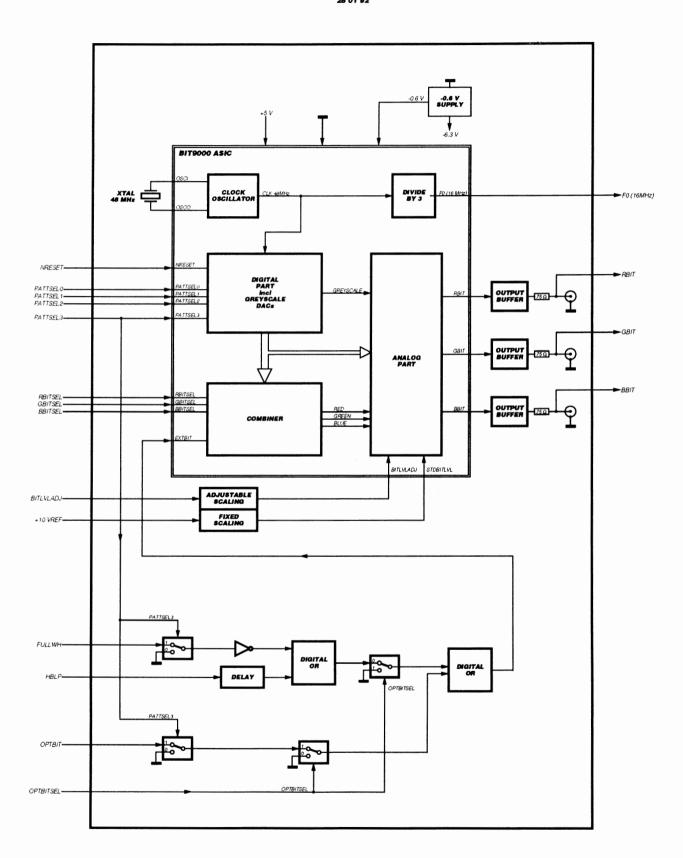
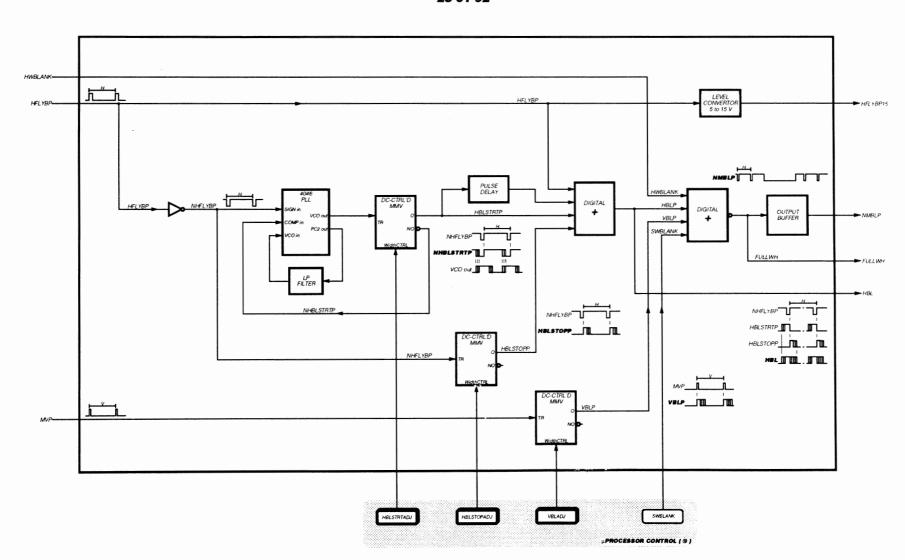


figure 2.31 : BIT (Built-In Test) generator block diagram

MPRD 9600 BLANKING Generator (on ©) (part of Processor board) 28 01 92



MPRD 9600 ADJUST VOLTAGE GENERATOR (on ©)

(part of Processor board) 28 01 92

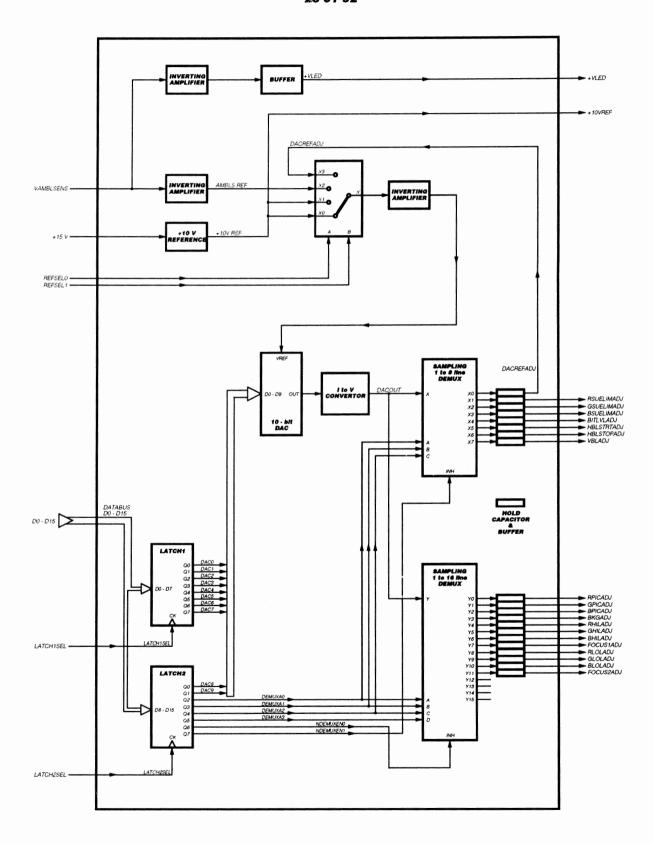


figure 2.33 : adjust voltage generator block diagram

2.4.3 CIRCUIT DESCRIPTION

CLOCK GENERATOR (sheet 6 of 7)

The clockgenerator is integrated in U220 (ASIC = Application Specific Integrated Circuit). The frequency is determined by Y200 (48MHz), U220 divides by 3, the 16MHz (=F0) leaves at pin43.

Derived Clocksignals (sheet 1 of 7)

F0 clocks U4,pin2, a 4 bit counter; the output signals are:

- F1 (8MHz) the processorclock,
- F2 (4MHz) driving the baudrategenerator,
- F3 (2MHz),
- F4 (1MHz) clocking the bus error generator.

RESET GENERATOR & WATCHDOG (sheet 1 of 7)

During power-on, after the +5V power supply has exceeded a certain level (adjustable with P200), U13, pin8 remains low during 150ms.

- The signal is buffered by: U14,pin10,11, pulled up by R16 and connected to the active-low HALT input of the uprocessor,
 - U14,pin13,12, pulled up via D201,R15,R49 and connected to the active-low RESET input of the uprocessor.

As a result, the uprocessor will start under normal power conditions after 150 ms.

During "power-on reset" led200,201 will light.

In TEST mode, J222 is connects U23,pin1 to the +5V. U27 is always clocked, NSYSIRQP is connected to U13,pin3, U13,pin8 remains high and the watchdog is disabled.

In RUN mode, J222 connects U23, pin1 to NWDOGP (U218, pin2). NWDOGP is set low is software watchdog detects a software error. If U23,pin1 goes low U27 will not be clocked any more, (NSYSIRQ level does not change). After 250 ms U13,pin8 goes low. The reset and halt line of the uprocessor go low. Yellow led D201 lights during RESET, after 1 s the µprocessor will restart. The keypad shows : ERROR PROCESSORBOARD, REBOOT SYSTEM.

ADDRESS DECODING

2 GALs (Generic Array Logic) U215,216 support the address decoding.

Addressbits A(23) - A(10) are decoded and select 11 memorybanks or I/O devices.

U215 activates NSRAMSEL, NEPROMSEL and NEPROMSEL; U216 activates NPERI8SEL (PIA and 2 ACIAs) and 7 latches (8bit each) LATCH1(->7)SEL.

BUS ERROR GENERATOR

2 Counters in U5 divide the 1MHz clocksignal by 256; if the counters are not reset by NAS (every 127µs maximum), U5, pin8 will go high, via inverter U20, pin3,4,5,6 the NBERR input of the uprocessor will be activated; the processor is reset (no message on keypad).

INTERRUPT INTERFACE

The uprocessor has 3 interrupt lines IPL0-2 allowing to decode 8 interrupts, the interrupts are encoded by U25. NPIAIROA, NACIA1IRO, NACIA2IRO and NPIAIRQB are connected to the encoder.

ADJUST VOLTAGE GENERATOR (sheet 2 of 7)

20 Adjustable voltages are generated by the Adjust Voltage Generator.

Databits D0-D7 are latched by U28, databits D8-D9 are latched by U24, the latched databits are connected to the 10 bit DAC (U221).

VREF, required by the DAC, depends on the status of U34,pin9,10. Under normal conditions X0 (pin12) or X1 (pin13) will be connected to COMMON X (pin13). The +10V REF goes through U34, is inverted by U39,pin12,13,14, and the DAC receives -10V at U221,pin15, +10V REF can be adjusted by P210.

The DAC gain is adjustable with P204, (outputspan covers 0-10.23V - 10bit); via a compensated I-V converter (U35,pin1,2,3) the DAC outputsignal (pin1) is connected to the demultiplexers U30,32.

Databits D10-15 are latched by U24 (DEMUXA0-3, NDEMUXEN0-1) and level adapted (DEMUXA0-3/15, NDEMUXEN0-1/15) by U29. The DEMUX-signals select which inputpin of U30,32 will receive DACOUT and also define the time during which one of the outputs of U30,32 (selected by the DEMUX address lines) will be connected to that inputpin; the outputs of U30,32 are connected to hold circuits, sampling action is defined by DEMUX enable lines.

iHILADJ, iPICADJ (i = R,G or B)

One of the demultiplexer outputs, DACREFADJ (U32,pin13), can be used as reference voltage (after sample and hold with U32, C212, U33,pin12,13,14) for the DAC.

U15 adapts the level of REFSEL0-1, U34,pin11 will be selected as active input by REFSEL0-1/15. DACREFADJ is now connected to U221,pin15 via U34,pin11,13.

iHILADJ sets the maximum for iPICADJ, iPICADJ can vary from 0 to iHILADJ (10 bit resolution).

iHILADJ is generated with the 10V REF signal connected to the DAC (normal condition). When changing iPICADJ, the iHILADJ is sent to DACREFADJ as current voltage reference, the outputspan of the DAC is now limited to iHILADJ but the 10 bit resolution is maintained.

AMBIENT LIGHT CONTROLLER (ALC)

VAMBLSENS coming from the lightsensor is buffered, inverted and rescaled by U39,pin5,6,7. The outputsignal U39,pin7 is used as reference voltage for the DAC (ALC on, 4000 LUX on bezel ≈10V) for iPICADJ.

FRONT PANEL LED INTENSITY DRIVER

VAMBLSENS is also used to control the intensity of the leds on the front panel. The signal is buffered, inverted and rescaled by U39,pin8,9,10. Q204 drives the anodes of the leds on the control panel, if the ambient light intensity increases, +VLED will increase as well.

MEMORY & PARALLEL I/O INTERFACE (sheet 3 of 7, 4 of 7)

The SRAM sockets U201,206 accept 32,128 or 512 Kbyte chips, J219 selects the memory range and is set default on 32 & 128 Kbyte (J219 not mounted, connection made by copper trace).

The E²PROM sockets U202,207 accept 2,8 or 32 Kbyte chips, J211,213,220 select the memory range and is set default on 2 Kbyte (J211,213,220 not mounted, connection made by copper trace).

The EPROM sockets U203,208 accept 128,256,512 or 1024 Kbyte chips, J211,213,220 select the memory range and is set default on 128 & 256 Kbyte (J211,213,220 not mounted, connection made by copper trace).

Memory Control Logic (Output Enable, Low/High Byte Select, Read/Write)

NWELO is the control signal for the low byte (SRAM, E²PROM) and is the OR function (U21,pin1,2,3) of NLDS and R/NW.

NWELO will be low when NLDS and R/NW are low, both low banks receive the same signal but only one of both will be selected by the seperated chip select control line (NSRAMSEL or NE2PROMSEL).

NWEHI is the controlsignal of the high byte (SRAM,E²PROM) and 1 is the OR function (U21,pin4,5,6) of NUDS and R/NM.

NWEHI will be low when NUDS and R/NW are low, both high banks receive the same signal but only one of both will be selected by the seperated chipselect controlline (NSRAMSEL or NE2PROMSEL).

NOE is common for low/high bank and for all memory, NOE is the NAND function (U16,pin4,5,6) of the NAND function (U16,pin1,2,3) of NLDS and NUDS with R/NW; NOE will be low if at least one of both datastrobes is low and R/NW is high.

PIA U218 is selected by NPERI8SEL and addressbit A(5), the latches 3,4,5,6,7 (and also the latches 1,2 on sheet 2 of 7) are selected by LATCHxSEL coming from GAL (U216).

ACIA1 is selected by NPERI8SEL and addressbit A(3), ACIA2 is selected by NPERI8SEL and addressbit A(4).

J200,201 is a future extension bus.

REMOTE CONTROL INTERFACE (SHEET 4 OF 7)

1²C Serial Interface Bus

The I2C Serial Interface Bus is implemented in software and uses four PIA-pins:

- * two outputs: NSCLDRIVE and NSDADRIVE, and
- * two inputs: SCLP and SDAP.

The DRIVE signals are inverted by Q10 and Q11 (sheet 4 of 7) to create the I2C bus lines SDA and SCL which are routed to the BACKBOARD and to pins 8 & 9 of the "CONTROL" connector to interface the I2C peripherals (Control Panel, Keypad, MicroController on the Deflection Board, ...) to the main MicroProcessor. The I2C lines are monitored by this MicroProcessor via the SDAP and SCLP lines which are fed back to the PIA inputs.

RS232 REMOTE CONTROL BUS

MONDATOUT & CTRLDATIN

The main MicroProcessor controls the RS232 REMote Control Bus via ACIA1 which is connected to the lower data bus (D0...D7). Selection of the internal ACIA registers is done by the lowest address line A1, the ACIA chip is selected by NPERI8SEL (which is a common select line for all 8-bit peripheral chips) and address line A3.

The Transmit and Receive Clocks are both connected to the VARBAUD clock line which is the output of selector U26 (sheet 1 of 7). Depending on software selection (BAUD0 & BAUD1), this clock signal can be either 16 x 9600, 16 x 4800, 16 x 2400 or 16 x 1200 Hz. These frequencies are derived from the main 16 MHz clock via counter U4 (+4), divide-by-13 counter U23 and binary counter U27.

The TXD line (pin 6 / U204) is routed to pin 13 of the double 4-position selector U40. This selector is controlled by hardware jumper J227 (3 positions) and selects between three different drivers for the TXD line:

- * the RS422/423 (RS4XX) driver U210 (jumper position "4"), signal name "RS4XXTXDTA",
- * a driver on the Optional board (jumper position "O"), signal name "OPTTXDTA",
- * and the RS232 driver/receiver U219 (jumper position "2"), signal name "RS232TXDTA", which is discussed here.

The driver output (pin 3) is called "MONDATOUT" (the RS232-version of TXD/ACIA1 or "REMDATOUT") and is connected to pin 2 of the "REMOTE IN" connector.

The RS232 line from the host (entering via pin 3 of "REMOTE IN") is called "CTRLDATIN" and is converted to TTL levels by U219. The output of the receiver (pin 13) is called "RS232RXDTA" and is presented to one of the inputs (pin 4) of selector U40. Similar to the lower part (X) this Y-selector is again controlled by hardware jumper J227. This means that either RS4XXRXDTA or OPTRXDTA or RS232RXDTA can be selected for the RXD input

of ACIA1. The output of this Y-selector U40 is called "REMDATIN" and is normally routed to the RXD input of ACIA1 via the A-part of the triple 2-positions selector U12. The function of this selector will be described in paragraph 2.5.

The RS232 (and OPT) REMote interface does not use hardware handshake. This means that the handshake inputs of ACIA1 (NDCD, pin 23 and NCTS, pin 24) must be "low" if jumper J227 is put in the position "2" (and "O"). On the other hand, for RS4XX communication, these ACIA1 handshake inputs must be connected to the corresponding RS4XX receiver outputs (pins 3 & 11 / U211) for the "RR" and "DM" handshake lines.

OSDATA

To interface the **BARGO** Optisense® or the Thoma Colour Analyser to the monitor, a second RS232 receiver-only channel is provided. The RS232/4800 Baud Optical Sensor signal line is entering at pin 4 of the "CONTROL" connector (Processor board or Frontal Control Panel): "OSDATA". This RS232 signal is converted to TTL levels by receiver(/driver) U219: "OSRXDTA" (pin 11). OSRXDTA is connected to the RXD input of the second ACIA via B-selector of U12 which is controlled by the "OS/NIMBSEL" line (see also paragraph Serving three ports with two ACIAs: switching logic). This select line also controls the C-part of selector U12 to make sure that the Receiver Clock input of ACIA2 (RXC, pin 3 / U209) is connected to the fixed 4800BAUD clock line (16 x 4800 Hz) if Optical Sensor data must be read by the software.

No hardware handshake is required for ACIA2: pins 23 & 24 are grounded (see also RS485 InterMonitorBus).

RS4XX REMOTE CONTROL BUS

Similar to the RS232 (and OPT) REMote control bus, the RS4XX bus is supported by ACIA1 via selectors U40 and the A-part of U12. In this way, TXD/ACIA1 (REMDATOUT) becomes "RS4XXTXDTA" which is connected to driver U210 via invertor U17,pins 11&10. Output D (pin 13) of receiver U211 is "RS4XXRXDTA" and becomes "REMDATIN" which is connected to the RXD input of ACIA1 via the A-part of selector U12.

DRIVER

The 26LS30 driver for RS4XX can be put in the RS422 or the RS423 mode by applying the appropriate level to Mode pin 4. The 26LS30 is a dual RS422 line driver with mode pin low or a quad RS423 line driver with mode pin high. In the RS422 mode, input A (pin 2) and input D (pin 7) are the two driver inputs. The outputs are labeled Ao (pin 15/non-inverting) & Bo (pin 14/inverting) for the A input, and Co (pin 11/inverting) & Do (pin 10/non-inverting) for the D input. The B and C inputs are active-high disable inputs for the first (A input) and the second (D input) driver. These disable lines are controlled by the "NDRVR422EN" line under software control.

In the RS423 mode, there are four (non-inverting) drivers A...D. Outputs B and C are not used: their corresponding lines (SD-B and TR-B) are grounded by jumpers J205 and J204. In this mode, it is not possible to put the driver outputs in the TRI-STATE mode.

RECEIVER

The 26LS32 is a quad differential line receiver designed to meet the RS422 and RS423 Standards for balanced and unbalanced digital data transmission. It has an enable (pin 4) and disable (pin 12) function, common to all four receivers. This feature is used to switch between two kinds of operation: with or without hardware handshake. As already explained earlier, only RS4XX communication needs hardware handshake. This means that in all other cases where ACIA1 is used for serial communication, inputs 23 & 24 of this ACIA1 must be "low". This is implemented as follows: the two ACIA handshake inputs are pulled low by resistors R93 & R94, IF the 26LS32 receiver outputs are disabled by pulling the disable input (NE, pin 12) "high". This is true in three situations: * jumper J227 in position "2" (RS232) or "O" (OPTional)

* the InterMonitorBus (see also next paragraph) is served by ACIA1, irrespective of the position of hardware jumper J227 (in this particular case, the line "IMB/NREMSEL" is put "high" by software).

RS485 INTER MONITOR BUS

This bus is normally (see also next paragraph) driven by ACIA2. Two 75175 Multipoint RS485 Transceivers are used. Each transceiver consists of a driver (input "D", pin 4) and a receiver (output "R", pin 1). The non-inverting output of the driver and the corresponding input of the receiver are connected together: input/output "A", pin 6. In the same way the inverting driver output and receiver input are connected to input/output "B", pin 7. Driver and receiver outputs can be enabled or disabled independently: active-low receiver enable (pin 2) and active-high driver enable (pin 3).

As the InterMonitorBus is full-duplex, two transceivers are used: one for transmit and the other one for receive. Depending on the Remote Status of the monitor (Master or Slave), transceiver U212 acts as a Master Receiver or a Slave Transmitter. Similarly, U217 is either a Master Transmitter or a Slave Receiver.

The transceiver enable/disable lines are controlled by software: either the upper receiver (in U212) or the lower receiver (in U217) is enabled by "NSRX/MRXSEL", the Slave Transmitter is enabled by "NSTXSEL" and the Master Transmitter by "NMTXSEL".

The driver inputs of the two transceivers are unconditionally connected to the TXD output of ACIA2 ("IMBDATOUT"). The receiver outputs however are connected to the RXD input of ACIA2 ("IMBDATIN") via the B-selector of U12, which is controlled by the "OS/NIMBSEL" line (see also next paragraph). This select line also controls the C-part of selector U12 to make sure that the Receiver Clock input of ACIA2 (RXC, pin 3/U209) is connected to the fixed 9600BAUD clock line (16 x 9600 Hz) if the IMB is activated (OS/NIMBSEL "low").

The InterMonitorBus does not require any hardware handshake for ACIA2: pins 23 & 24 are grounded.

Serving three ports with two ACIAs: switching logic

As already described in the previous paragraphs, the two ACIAs are serving three ports:

- * the **REM**ote Control Bus (either RS232, RS4XX or OPT),
- * the InterMonitorBus (RS485)
- * and the Optical Sensor receive-only port (RS232).

The general rule for the switching logic is:

ACIA1 is serving the REMote Control Bus,

ACIA2 is serving the InterMonitorBus.

The "driving force" behind the switching logic is the possibility to interconnect monitors in different configurations:

- * Single Monitor Configuration:
 - without Optical Sensor (either Optisense® or Thoma Colour Analyser)
 - with Optical Sensor.
- * Multiple Monitor Configurations:
 - without Optical Sensor
 - with Optical Sensor connected to the Master
 - with Optical Sensor connected to one of the Slaves.

The following table gives an overview of the different possibilities. The upper part of the table is an analysis of the needs and the lower part gives a summary of the implementation of the switching logic: the status of five different control or select lines is defined for the different configurations:

"IMB/NREMSEL" is connected to the hardware handshake line "NRTS" of ACIA2 and is programmed by the software as a general purpose output line (similar to a PIA output).

It controls the A-selector of U12 and switches between REMDATIN (IMB/NREMSEL "low") and IMBDATIN (IMB/NREMSEL "high"). Case [5] in the table is the situation where ACIA1 is used to read IMBDATIN in stead of REMDATIN. To make sure that ACIA1 will function properly, the hardware handshake inputs pin 23 & 24 must be low, irrespective of the position of jumper J227, the Communication Standard Selector. This is accomplished by having IMB/NREMSEL=high force high the disable input of receiver U211 (26LS32) via OR-gate U21, pins 12,13,11 (see also paragraph RS4XX RECEIVER).

"OS/NIMBSEL" is output Q3 of LATCH4, controlled by the software.

It controls the B- and C-selectors of U12. The B-selector switches between IMBDATIN (OS/NIMBSEL "low") and OSRXDTA (OS/NIMBSEL "high"). The C-selector switches in a similar manner between 9600BAUD for IMBDATIN and 4800BAUD for OSRXDTA. The normal situation is that ACIA2 is reading the Optical Sensor data. The only exception is case [3], where no sensor is connected at all and where the Master has the full control over the Slaves.

"BAUD0" & "BAUD1" are outputs Q4 & Q5 of LATCH4, controlled by software.

These lines control the Baud rate for the REMote Control Bus (either RS232, RS4XX or OPT). The four possibilities for VARBAUD are listed in the table. There is one special case [5], where both lines must be forced low by software to read IMBDATIN via ACIA1 at the predefined 9600 Baud rate.

"NHWHANDSH" is the output of OR-gate U21, pins 12,13,11, partially controlled by the hardware jumper J227 and partially controlled by software (IMB/NREMSEL).

As already explained earlier in this paragraph and in paragraph 2.3, this line is "high" if NO hardware handshake is required. The only special case is [5], where this line must be forced high by IMB/NREMSEL=high, even if jumper J227 is put in the position "4".

TX / ACIA1 = REMDATOUT TX / ACIA2 = IMBDATOUT

RXC / ACIA1 = TXC / ACIA1 = VARBAUD

BAUD1	BAUD0	VARBAUD
	_	
0	0	9600
0	1	4800
1 1	0	2400
1	1	1200

IMB/NCTRLSEL	OS/NIMBSEL	RX / ACIA1	RXC / ACIA1	RX / ACIA#2	RX / ACIA2
0	0	REMDATIN	VarBaud	IMBDATIN	9600
0	1	REMDATIN	VarBaud	OSRXDTA	4800
1	0	IMBDATIN	VarBaud	IMBDATIN	9600
1	1	IMBDATIN	VarBaud	OSRXDTA	4800

				ACIA1			
	ComStd	RXD pin 2	RXC pin 3	ComStd	TXD pin 6	TXC	Handshake pins 5, 23 & 24
ngle Monitor onfigurations			(= VARBAUD)		(=MONDATOUT)		
	RS232	REMDATIN	VARBAUD	RS232	REMDATOUT	VARBAUD	N
] without OPTISENSE®	RS422/423 OPT (fiber)	REMDATIN REMDATIN	VARBAUD VARBAUD	RS422/423 OPT (fiber)	REMDATOUT REMDATOUT	VARBAUD VARBAUD	Y N
OPTISENSE®	OPT (fiber)	REMUATIN	VARBAUD	OPT (fiber)	REMDATOOT	VANDAUD	, N
	RS232	REMDATIN	VARBAUD	RS232	REMDATOUT	VARBAUD	N
OPTISENSE®	RS422/423	REMDATIN	VARBAUD	RS422/423	REMDATOUT	VARBAUD	Y
connected	OPT (fiber)	REMDATIN	VARBAUD	OPT (fiber)	REMDATOUT	VARBAUD	N
ultiple Monitor onfigurations							
	RS232	REMDATIN	VARBAUD	RS232	REMDATOUT	VARBAUD	N
] without	RS422/423	REMDATIN	VARBAUD	RS422/423	REMDATOUT	VARBAUD	Υ
OPTISENSE®	OPT (fiber)	REMDATIN	VARBAUD	OPT (fiber)	REMDATOUT	VARBAUD	N
OPTISENSE®	RS232	REMDATIN	VARBAUD	RS232	REMDATOUT	VARBAUD	N
connected	RS422/423	REMDATIN	VARBAUD	RS422/423	REMDATOUT	VARBAUD	l ÿ l
to MASTER	OPT (fiber)	REMDATIN	VARBAUD	OPT (fiber)	REMDATOUT	VARBAUD	N
OPTISENSE® connected to one of the SLAVEs	RS485	IMBDATIN	VARBAUD (= 9600)		REMDATOUT	VARBAUD (~ 9600)	N
UMMARY	1	ComStd	IMB/NREMSEL	OS/NIMBSEL	BAUD1	BAUD0	NHWHANDSH
UMMARY			IMB/NREMSEL	OS/NIMBSEL	BAUD1	BAUD0	
UMMARY	without	RS232	T				NHWHANDSH 1 0
	without		IMB/NREMSEL	OS/NIMBSEL X (1) (b)	BAUD1	BAUDO (a)	1 1
UMMARY ingle Monitor onfigurations		RS232 RS422/423 OPT (fiber)	T				1 0 1
ingle Monitor	OPTISENSE®	RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a)	1 0 1
ngle Monitor	OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423	T				1 0 1
ngle Monitor	OPTISENSE®	RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a)	1 0 1
ingle Monitor	OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423	0	X (1) (b)	(a)	(a)	1 0 1
ngle Monitor	OPTISENSE® OPTISENSE® connected	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a)	1 0 1 0 1
ngle Monitor	OPTISENSE® OPTISENSE® connected Master or Slave	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a) (a)	1 0 1 0 1
ingle Monitor onfigurations	OPTISENSE® OPTISENSE® connected Master or Slave without OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a) (a)	1 0 1 0 1
ingle Monitor onfigurations	OPTISENSE® OPTISENSE® connected Master or Slave without OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423	0	X (1) (b)	(a)	(a) (a)	1 0 1 1 0 1
ingle Monitor onfigurations	OPTISENSE® OPTISENSE® connected Master or Slave without OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber)	0 0 0 (c)	X (1) (b)	(a) (a)	(a) (a)	1 0 1 0 1 1 0 1 1
ingle Monitor	OPTISENSE® CONNECTED Master or Slave without OPTISENSE® OPTISENSE®	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423	0 0 0 (c)	X (1) (b)	(a) (a)	(a) (a)	1 0 1 0 1 0 1 0 0 1
ingle Monitor onfigurations	OPTISENSE® connected Master or Slave without OPTISENSE® connected to MASTER	RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber) RS232 RS422/423 OPT (fiber)	0 0 0 (c)	X (1) (b)	(a) (a)	(a) (a)	1 0 1 0 1 1 0 1 1 0 1 1 0 1 1 1 0 1 1 1 1 0 1

		(= IMBDATOUT)	(= 9600)	(= N)
nat used	don't care	IM80ATQUT	9600	N

IMBDATIN 9600 RS485 IMBDATOUT 9600 Ν RS485 OSRXDTA IMBDATOUT 9600 Ν RS232 4800

IMBDATOUT OSRXDTA RS485 9600 Ν RS232 4800

shaded areas : don't care situations

is needed when OPTISENSE® data must be read.

N:no Y:yes

X : don't care

(a): 9600, 4800, 2400 or 1200 baud - software programmable, depending on application. (b) : if don't care is programmed as "1", then case [1] is identical to case [2] and no special action

The monitor can be controlled by a host via ACIA1 and read data from an OPTISENSE® via ACIA2.

A Master can be controlled by a host (ACIA1), while communicating with a Slave via the IMB-bus (ACIA2). A Slave in this case [3] only has to communicate with the Master via the IMB-bus (ACIA2), hence ACIA1 is not used: don't care in position (c) for SLAVEs only, to be programmed "0" as if the Slave is a Master; so no difference exists between Master and Slave if both without OPTISENSE®. If the monitor is a Master that wants to read OPTISENSE® data (via ACIA2), software must switch from case [3] to case [4]: OS/NIMBSEL line must change state. ACIA1 is then used for communication between host and Master monitor.

If the monitor is a Slave that wants to read OPTISENSE® data (via ACIA2), software must switch from case [3] to case [5]: both IMB/NREMSEL and OS/NIMBSEL must change state. This Slave communicates with the Master via the IMB-bus: ACIA1 instead of ACIA2 is used for SRX (IMBDATIN) and ACIA2 is used for STX (IMBDATOUT). [ACIA2 is always used for IMBDATOUT (STX or MTX)]. Remark (d): Case [5] is the only case that does not allow REMote control by a host. To make sure that ACIA1 can process IMBDATIN (no handshake needed nor allowed), a "NO" must be forced in position (d) so that ACIA1 will work without Handshake, even if RS422/423 is selected as the Communication Std.

Remark:

Signal:	ComStd:	RS232	RS422/423	OPT
REMDATIN		RS232RXDTA	RS4XXRXDTA	OPTRXDTA
REMDATOUT			RS4XXTXDTA	

ACIA2

RXC

4800

RXD

OSRXDTA

ComStd

RS232

ComStd

TXD TXC

9600

TUDTAGBMI

Handshake

H & V BLANKING GENERATOR (SHEET 5 OF 7)

Horizontal Blanking Start Pulse Generator

VCO & Phase Comparator

The PLL (Phase Locked Loop) will regulate the VCO frequency and phase in such a way that the rising edges of NHFLYBP (SIGN in) and NHBLSTRTP (COMP in) are coincidental.

HFLYBP is inverted by U2,pin1,2,3 and connected to the PLL, U3,pin14 (SIGNin).

VCO out (pin4) is connected to a DC controlled (HBLSTRTADJ) monostable (Q2,Q5,U10,U18). The inverted output of the monostable is connected to the other PLL input (COMP in).

These inputs are triggered by a rising edge. If VCO out would be connected straight to COMP in, VCO out would have the same frequency as SIGN in (but 50 % duty cycle). As VCO out is delayed and inverted (=NHBLSTRP), COMP in will be triggered by the delayed (but inverted!) falling edge of VCO out. As a result, VCO out will go high BEFORE (time adjustable with HBLSTRTADJ) NHFLYBP goes high.

HBLSTRTP (has to blank before flyback) goes high before flyback has started (delay DC adjustable).

J228 selects the LOw or HIgh frequency range for the PLL, to match the processor board with the deflection board hor, freq. range.

DC controlled monostable

The rising edge of VCO out (50% duty cycle) clocks the D-FF U18,pin3. U18,pin5 goes high (= start of HBLSTRTP), U18,pin6 goes low, Q5 goes off and C203 is charged by Q2 (constant current source). If the voltage across C203 exceeds the voltage on U10,pin4 (= rescaled HBLSTRTADJ) U10,pin12 will go low and reset U18; U18,pin5 goes low (= end of HBLSTRTP), U18,pin6 goes high and triggers the PLL; Q5 goes on and discharges C203, the level of U10,pin5 does not any longer exceed the level of U10,pin4 and U10,pin12 goes high again.

Horizontal Blanking Stop Pulse Generator

DC controlled monostable

The rising edge of NHFLYBP clocks the D-FF U18,pin11. U18,pin9 goes high (= start of HBLSTOPP), U18,pin8 goes low, Q7 goes off and C204 is charged by Q4 (constant current source). If the voltage across C204 exceeds the voltage on U10,pin9 (= rescaled HBLSTOPADJ) U10,pin7 will go low and reset U18; U18,pin9 goes low (= end of HBLSTOPP), U18,pin8 goes high; Q7 goes on and discharges C204, the level of U10,pin10 does not any longer exceed the level of U10,pin9 and U10,pin7 goes high again.

Vertical Blanking Pulse Generator

DC controlled monostable

The rising edge of MVP sets the RS-FF U2,pin8,9,10,11,12,13. U2,pin13 goes high (= start of VBLP), U2,pin10 goes low, Q1 goes off and C205 is charged by Q3 (constant current source). If the voltage across C205 exceeds the voltage on U17,pin2 (= rescaled HBLSTOPADJ) U7,pin1 will go high and reset the RS-FF; U2,pin13 goes low (= end of VBLP), U2,pin10 goes high; Q1 goes on and discharges C205, the level of U7,pin3 does not any longer exceed the level of U7,pin2 and U2,pin1 goes low again.

Mixing Stage and Output Buffer

HBLSTRTP, the delayed (R34,C48) HBLSTRTP, HBLSTOPP and HFLYBP are NORed by U1,pin9,10,11,12 and inverted by U2,pin4,5,6; the result is HBLP.

HBLP, VBLP, HWBLANK and SWBLANK are NORed by U1,1,2,3,4,5; the output is buffered by Q8,9.

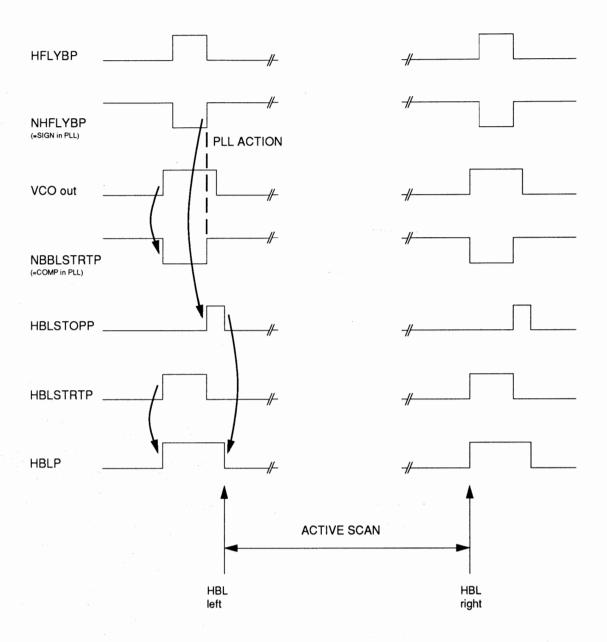


figure 2.34: horizontal blanking generator timing diagram

BIT GENERATOR (sheet 6 of 7)

The MPRD/CCID 9000 monitor is equipped with a built-in test ("BIT") generator, implemented in ASIC technology: BIT9000 (U220).

The timing of BIT9000 is controlled by a 48 MHz XTAL (Y200) which oscillates at its 3rd overtone. Oscillation at its ground frequency is prevented by L1 and C101.

The 48 MHz clock is divided by 3 to generate the basic 16 MHz clock (F0, pin 42) for the MicroProcessor part of this board.

The patterns generated in BIT9000 using the 48 MHz dot clock are defined by 769 active dots in a line and 769 active lines in a field in case of a 4:3 aspect ratio. For a 5:4 aspect ratio, the first 48 active dots of "crosshatch" and "field" are dropped, leaving 721 active dots by 769 active lines; the other pattern elements (colour bars, grey scales & box) are shifted 24 dots to the right. In this way, the horizontal and vertical scan frequencies remain constant, only the backporch of the BIT signal is increased by $1 \,\mu s$.

The complete scan parameters for the BIT patterns are as follows:

```
* Horizontal: - Active =
                                      16 \mu s (AR = 4:3) \text{ or } 15 \mu s (AR = 5:4)
               - Blanking =
                                      4 μs or 5 μs
               - Front Porch =
                                      1 µs
               - Sync Width =
                                      1 µs
               - Backporch =
                                      2 \mu s or 3 \mu s
                                      20 \mu s (Hor. Freq. = 50 kHz)
               - Total =
*Vertical:
               - Active =
                                      769 lines
               - Blanking =
                                      31 lines
                                      2 lines
               - Front Porch =
               - Sync Width =
                                      2 lines
               - Backporch =
                                      27 lines
               - Total =
                                      800 lines (Vert. Freq. = 62.5 \text{ Hz})
```

The different patterns are selected by PATTSEL0...3 under software control, according to the following rules:

* PATTSELO & 1 (pins 6 & 5) select between STanDard BIT, CROSSHatch, BOX and Field:

<u>Pattern</u>	PATTSEL1	PATTSEL0
STDBIT	0	0
CROSSH	0	1
BOX	1	0
FIELD	1	1

- * PATTSEL2 selects between AspectRatio = 4:3 ("low") and AR = 5:4 ("high")
- * PATTSEL3 selects between the internally generated patterns ("low") and the possibility to accept externally generated patterns ("EXTBIT") for subsequent processing inside BIT9000.

The Red, Green and Blue BIT outputs (pins 11, 10 & 9) can be switched on or off under software control by putting R-, G- and/or BBITSEL (pins 2, 1 & 44) "high" (on) or "low" (off).

The output levels of the three channels is defined by two DC voltages:

* STDBITLVL is a fixed voltage (approx. 1.4 Vdc) derived from the +10VREF voltage and is used only if STDBIT is selected.

As the STDBIT pattern is selected to check proper operation of the monitor at a glance (by selecting "BIT" on the Control Panel), it is impossible to modify this pattern (e.g. switching off all channels) by software; this is prevented by the hardware design.

* BITLVLADJ is a variable dc voltage, controlled by software (approx. 0...1.4 Vdc) and is used to define the video output levels of all three channels simultaneously for the three other patterns: CROSSH, BOX and FIELD. The nominal level of 700 mVpp (corresponding to 1.4 Vpp unterminated) is adjustable by the GAIN control adjustment P205.

Power supply for the digital part of BIT9000 is between -0.6V and +5V. Black level is defined by the GND potential, White level is defined by BITLVLADJ or STDBITLVL (referenced to GND) and Sync Tip level (on GBIT only) is defined by the -0.6V supply (generated by D203 & Q203).

The video outputs are buffered by 75Ω drivers (Q200, Q201 & Q202). In case no Optional board is installed, de three BIT signals are routed to the RGB Amplifier board by three coax cables connected to J223, J224 & J225. If an Optional board is inserted, the three coax cables must be inserted in the corresponding coax connectors on that Optional board. The three BIT signals are then routed to that board via the Backboard (J208, pins c9, c10 & c11) and processed together with the outputs of that Optional board (switching between BIT signals and the corresponding OPT outputs) under control of the software.

EXTBIT is connected to the output of switching logic (part of U16, part of U20 and U19) that switches between FULLWH (derived from the Blanking Generator) and OPTBIT (J200, pin 10) under control of the OPTBIT(/ NFULLWH)SELect line and the PATTSEL3 line. This possibility can be used for future expansion.

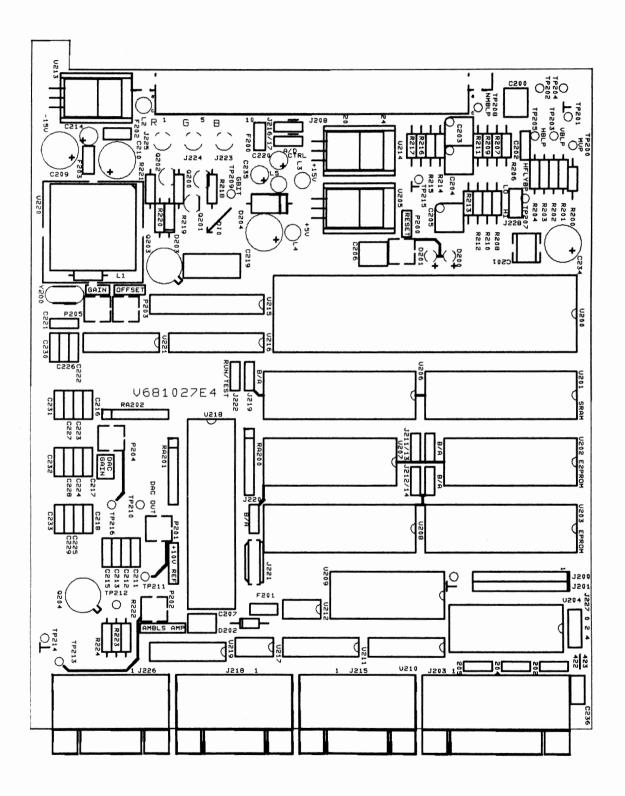


figure 2.35: PROCESSOR board component side

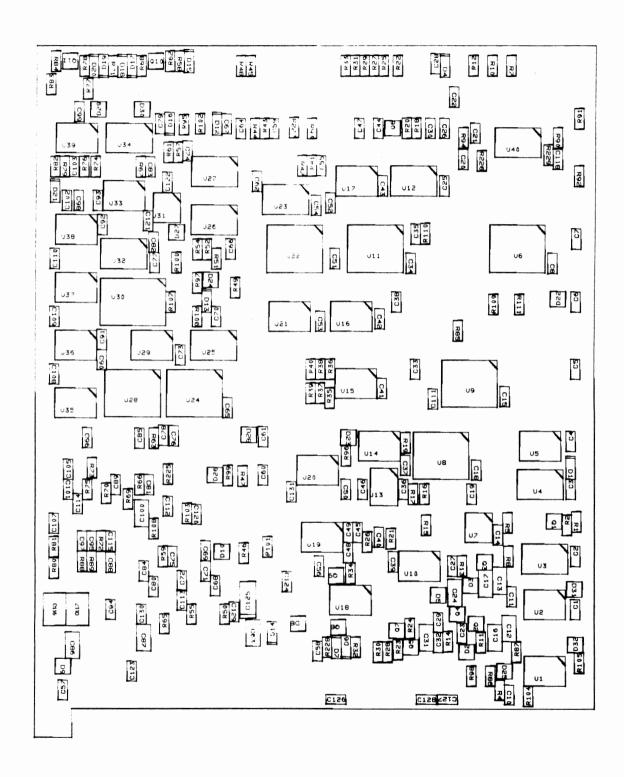


figure 2.36: PROCESSOR board solder side

2.4.5 PARTSLIST

Order number of a complete PROCESSOR BOARD : V5631220 09 Date : 01/12/92

Order number	Description	Item
V101223	R MF H 82E J 0W5	R220
V101224	R MF H100E J 0W5	R203
V101231	R MF H390E J 0W5	R218, R219, R221
V101231 V101232	R MF H470E J 0W5	R204
V101232 V101247	R MF H 8K2 J 0W5	R222
V101248	R MF H 10K J 0W5	R224
V101252	R MF H 22K J 0W5	R233
V101260	R MF H100K J 0W5	R223
V101261	R MF H120K J 0W5	R201
C1026008	R MF H100K F 0W6	R212
V1026048	R MF H110K F 0W6	R213
V1026087	R MF H 12K1 F 0W6	R207,R215
C1026247	R MF H 17K8 F 0W6	R217
V1026297	R MF H 20K F 0W6	R206
V1026406	R MF H 2K4 F 0W6	R211
V1026417	R MF H 26K7 F 0W6	R200
V1026496	R MF H 3K24F 0W6	R214
V1026687	R MF H 51K1 F 0W6	R202
V1026747	R MF H 59K F 0W6	R210
V1026807	R MF H 68K1 F 0W6	R209
V1026828	R MF H715K F 0W6	R216
V1026906	R MF H 8K66F 0W6	R208
V107004	R TCE H200E M 0W5 S7 TS	P205
V107005	R TCE H500E M 0W5 S7 TS	P204
V107009	R TCE H 10K M 0W5 S7 TS	P201, P202
V107013	R TCE H100K M 0W5 S7 TS	P200
V1114879	C EL RA 100M M 35E2 105	C209,C210,C219,C234
V1114942	C EL RA 10M M 50E1 105	C214,C220,C235
V112829	C CE DI 2N2S400E3	C236
V114088	C POMERA 100N K 50E2 85	C202,C211,C212,C213,C215,C216,
V111000	C FOREIGN FOOR R SOLZ OS	C217, C218, C221, C222, C223, C224,
		C225, C226, C227, C228, C229, C230,
		C231,C232,C233
V114096	C POMERA 1M K 50E2 85	C200, C206
V115162	C PP RA 1N5J100E2 85	C207
V1158138	C PS RA 2N74F63E3 85	C207
V1158138 V1158191		C205,C204
V1163054		
V131411		C201
	_	Q200,Q201,Q202
V131425	Q BC141-10 N P TO39 Q BC161-10 P P TO39	Q204
V131432		Q203
V1316211	D 1N4148 SW DO35	D33 , D34
C131646	D 1N4007 R DO41	D202
V131658	D LED D3 T YEL	D201
V131662	D LED D3 T RED	D200
C131714	D ZEN 1V4 0W4 C DO7	D203
V131787	D TVS 5V 1500W U CB429	D204
V1330769	Q ACC WSHR TO5-4	0070
V133091	Q ACC HTSNK 40 K TO220	N200, N201, N202
V1340100	U 7815 TO220 P	U214
V1340131	U 2990-15 LM TO220 P	U213
V134044	U 2940-5 LM TO220 P	U205
V1342561	U 7533 AD DIP16 I	U221
V134257	U 145406 MC DIP16 P	U219
V1372010	U 26LS32 DIP16 M	U211

```
Item
Order number Description
                                           U210
V1372020
             U 26LS30
                               DTP16 M
                                           U212, U217
              U 65176
                               DIP8
                                      Τ
V1372051
                        SN
                               DIP24 I
                                           U202, U207
V1372131
             U 28C16
                                     C
                                           U204, U209
V1372352
              U 68A50
                               DIP24
                               DIP40 I
                                           U218
V1372361
              U 68A21
             U SRAM 128KX8 -15DIP32 I
                                           U201,U206
V1372821
                               DIP64 I
                                           U200
V1372991
              U 68HC000
                       BIT
                                           U220
V1376001
              U#9000
                               PLCC44 I
                                           A202
V1407103
              R AB 6 10K G 0W2 SIP7
                       3K3 G 0W2 SIP7
                                           A200, A201
V1407332
              R AB 6
V301102
              COIL CAN 7.5X7.5X12
                                    606
                                           0210
V306100
              CH AX NS
                        9
                            UH
                                           L2 ,L3 ,L4 ,L5
                              NH
                                           L1
             CH AX NS 470
V3061164
                                           0060
V306800
             X ACC INSUL HC49
             X 48.000000 MHZ HC49 S30
                                           Y200
V306852
V311061
             D ACC HLDR D3 P1 TS H 6.5
                                           0050
                                           J223, J224, J225
              J SMB
                      MBT P 1 50E
V313202
             J MD2
                      MBT P20 E1AU
                                           J200
V3132069
                                           0105
C3132431
              J U0.6 FBT P24 E1SN
                                    SPG
              J U0.6 FBT P40 E1AU
                                    TLP
                                           0150
C3132441
V3132504
              J UPLCC FBT P44 E1SN SPG
                                           0160
                                           0130
V3132509
              J U0.3 FBT P24 E1AU TLP
              J U0.6 FBT P28 E1AU
                                           0100
                                    TLP
C3132531
              J MD1
                      MBT P 4 E1AU
                                           J227
V313388
V313392
             J MD
                      JMP P 1 E1AU
                                           0020
V313393
             J MD1
                      MBT P 3 E1AU
                                           J202, J204, J205, J222, J228
              J U0.3 FBT P 8 E1AU TLP
                                           0120
V3134911
                                           0110
V3134951
              J U0.3 FBT P16 E1AU TLP
V3134971
                                           0090
              J UO.6 FBT P32 E1AU TLP
V3134981
              J U0.9 FBT P64 E1AU TLP
                                           0080
              J D
                      ACC SCR_L U/U L 8
                                           0180
V3135035
              J DA S8 MBS P15 FU M BLE
                                           J203
V3135059
V3135169
              J DE S5 FBS P 9 FU M BLE
                                           J218, J226
              J DE S5 MBS P 9 FU M BLE
                                           J215
V3135179
V313525
              J EUR3C MBS P64 E1C2 S1.6
                                           J208
             J U0.3 FBT P20 E1AU TLP
                                           0140
V3135511
             J DUBX1 MBT P 5 E1AU
                                           J221
V313913
                   0A2
                                           F201
V3141981
             F
                           PTC
                                 MULTI
                                           F202, F203
V3141985
              F
                   0A5
                           PTC
                                 MULTI
V3141989
              F
                   1A1
                           PTC
                                 MULTI
                                           F200
V341000
              WIRE AWG28 W-WRAP YEL Y
                                           0240
              SLE OIL 0.5 RED
                                           0230
V347001
                                      Ν
              WIRE SADDLE 11X10MM
                                      Y
                                           0220
V3480602
              SMP-I M2.5X10 D 84
                                           0200
V3620146
V3620226
              SMP-I AM3 X 8 D 84
                                           0190
              NUT DIN934 I M2.5
V3661106
                                           0198
              NUT M3 PC BOARDS
                                           0193
V366940
V3673896
              WASHER INOX M2.5DIN137
                                           0199
V3673906
              WASHER CRINKLE I M3
                                           0191
V5681841
              SOFT LOW STD MPRD9600 06
                                           U203
V5681842
              SOFT HIGH STD MPRD9600 06
                                           U208
V5681851
              MAIN ADRESS DECODER
                                     00
                                           U215
              AUX. ADRESS DECODER
                                     0.0
                                           U216
V5681861
              CAPTIVE SCREW M3 X 8
                                           0201
V6030961
                                     00
V6030963
              CAPTIVE SCREW SPRING
                                     01
                                           0202
V603591
              U-PROC. PLATE
                                     01
                                           0203
              SMD MICROPR. MPRD 9600 05
                                           0010
V681027
V716543
              PCB TESTPOINT
                                     05
                                           0170
```

Order number	Description	Item
P200013	R# CE H 3E3 J 0W12 1206	R102
P200013	R# CE H 33E J 0W12 1206	R88 ,R89
P200037	R# CE H100E J 0W12 1206	R100,R101,R104,R105,R108,R225,
F200045	N# CE HIOOE O OWIZ 1200	R32 ,R45 ,R46 ,R48 ,R69 ,R95 ,
		R96 ,R97 ,R98 ,R99
D2000E1	R# CE H120E J 0W12 1206	R62
P200051		R10 ,R12 ,R20 ,R7 ,R71 ,R83
P200057	R# CE H220E J 0W12 1206	R72
P200065	R# CE H470E J 0W12 1206	R63
P200067	R# CE H560E J 0W12 1206	
P200069	R# CE H680E J 0W12 1206	R15 ,R19 ,R77
P200071	R# CE H820E J 0W12 1206	R23 , R28
P200073	R# CE H 1K J 0W12 1206	R103,R21 ,R22 ,R25 ,R26 ,R27 ,
		R29 ,R31 ,R33 ,R34 ,R59 ,R82
P200075	R# CE H 1K2 J 0W12 1206	R24 ,R30 ,R68 ,R78
P200081	R# CE H 2K2 J 0W12 1206	R109,R110,R111,R4 ,R47
P200083	R# CE H 2K7 J 0W12 1206	R16 ,R49
P200085	R# CE H 3K3 J 0W12 1206	R106,R36 ,R39 ,R85
P200089	R# CE H 4K7 J 0W12 1206	R2 ,R5 ,R58
P200095	R# CE H 8K2 J 0W12 1206	R1 , R84
P200097	R# CE H 10K J 0W12 1206	R107,R11 ,R13 ,R14 ,R18 ,R226,
		R227,R228,R229,R35,R37,R38,
		R40 ,R52 ,R54 ,R79 ,R90 ,R91 ,
		R92 ,R93 ,R94
P200101	R# CE H 15K J 0W12 1206	R41 ,R42 ,R43 ,R44
P200109	R# CE H 33K J 0W12 1206	R57 ,R61
P200113	R# CE H 47K J 0W12 1206	R51
P200121	R# CE H100K J 0W12 1206	R8 ,R87
P200125	R# CE H150K J 0W12 1206	R66
P200129	R# CE H220K J 0W12 1206	R17
P200137	R# CE H470K J 0W12 1206	R86
P200384	R# CE H 75E F 0W12 1206	R50 ,R55 ,R65
P200435	R# CE H 10K F 0W12 1206	R76
P200442	R# CE H 20K F 0W12 1206	R67 ,R73 ,R74 ,R80
P200672	R# CE H 6M8 K 0W12 1206	R75
P206339	R# CE H 3K4 F 0W12 1206	R81
P206341	R# CE H 3K57F 0W12 1206	R70
P210002	C(S)CEC2CH1812X7R474M 50	C100,C12 ,C13 ,C16 ,C17 ,C24 ,
		C31 ,C63 ,C86 ,C87
P210013	C(S)CEC1CH1206COG102J 50	C21 ,C22 ,C28 ,C30
P210064	C(S)CEC1CH1206COG220J 50	C101,C105
P210067	C(S)CEC2CH2321X7R105M 50	C116,C117
P210092	C(S)CEC2CH1206X7R103K 50	C114,C115,C126,C127,C128
P210100	C(S)CEC1CH1206COG470J 50	C10 ,C113,C129,C130,C48
P210122	C(S)CEC2CH1206X7R104K 50	C1 ,C102,C103,C107,C108,C109,
		C11 ,C110,C111,C112,C118,C120,
		C121,C122,C123,C124,C14 ,C15 ,
		C18 ,C19 ,C2 ,C20 ,C23 ,C25 ,
		C26 ,C27 ,C29 ,C3 ,C32 ,C33 ,
		C34 ,C35 ,C36 ,C37 ,C38 ,C39 ,
		C4 ,C40 ,C41 ,C42 ,C43 ,C44 ,
		C45 ,C46 ,C47 ,C49 ,C5 ,C50 ,
		C51 ,C52 ,C53 ,C54 ,C55 ,C56 ,
		C57 ,C58 ,C59 ,C6 ,C60 ,C61 ,
		C62 ,C64 ,C65 ,C66 ,C67 ,C68 ,
		C69 ,C7 ,C70 ,C71 ,C72 ,C73 ,

```
Order number Description
                                            Item
                                            C74 ,C75 ,C77 ,C78 ,C79 ,C8
                                            C80 ,C81 ,C82 ,C83 ,C84 ,C85 ,
                                            C88 ,C89 ,C90 ,C91 ,C92 ,C93 ,
                                            C94 , C95 , C96 , C97 , C98 , C99
                                            C76
              C(S)CEC1CH1206C0G330J 50
P210139
                                            C131
P210170
              C(S)CEC1CH1206COG560J 50
                                            C125
P212018
              C(S) TACH6032
                               106M 16
              SMC(S)ICCMOS
                               74HC74
                                            U18
P230052
                                            U32
P230063
              SMC(S)ICCMOS
                                 4051
                                            U34 ,U40
P230064
              SMC(S)ICCMOS
                                 4052
                                 4067
                                            U30
P230094
              SMC(S)ICCMOS
                              74HCT02
                                            U2
P230096
              SMC(S)ICCMOS
P230102
              SMC(S)ICCMOS
                              74HCT00
                                            U16
                              74HCT04
                                            U17
P230103
              SMC(S)ICCMOS
                                            U33 ,U35 ,U36 ,U37 ,U38 ,U39
                              TL0641
P230328
              SMC(S)ICLQUA
P230378
              SMC(S)ICTIM MB3773 SOF8
                                            U13
P230388
              SMC(S)ICHCT 74HCT393 SO14
                                            U5
                                            U20
P230423
              SMC(S)ICHCT 74HCT10 SO14
P230424
              SMC(S)ICHCT 74HCT32 SO14
                                            U21
              SMC(S)ICHCT74HCT574 SOL20
                                            U11 ,U22 ,U24 ,U28 ,U6
P230464
P230465
              SMC(S)ICHCT74HCT4053 SO16
                                            U12
              SMC(S)ICCOM LM219
                                   SO14
                                            U10
P230488
              SMC(S)ICHC 74HC4002 SO14
P230568
                                            U1
              SMC(S)ICHC 74HC4046 S016
P230569
                                            U3
              SMC(S)ICHCT74HCT273 SOL20
P230575
                                            U9
P230583
              SMC(S)ICCOM LM293
                                    S08
                                            U7
P230596
              SMC(S)ICHCT 74HCT27 SO14
                                            U19
              SMC(S)ICHCT 74HCT147 SO16
P230597
                                            U25
              SMC(S)ICHCT 74HCT151 SO16
                                            U26
P230598
              SMC(S)ICHCT 74HCT161 SO16
P230599
                                            U23 ,U4
P230601
              SMC(S)ICHCT74HCT4040 SO16
                                            U27
              SMC(S)IC74C 74C906 SO14
                                            U15 ,U29
P230603
P230604
              SMC(S)ICALS74ALS1035 SO14
                                            U14
              SMC(S)ICREF REF01
                                            U31
P230641
                               BC849C
                                            Q9
P232004
              SMC(S)TRA
                                            Q1
                                               ,Q10 ,Q11 ,Q5 ,Q7
P232069
              SMC(S)TRA
                               BT2369
P232101
              SMC(S)TRPNP BC859C SOT23
                                            Q2 ,Q3 ,Q4 ,Q6 ,Q8
                                            D10 ,D22 ,D23 ,D24 ,D25 ,D26 ,
P234047
              SMC(S)DIO
                                BAV99
                                            D27 ,D28 ,D29 ,D30 ,D31 ,D32 ,
                                            D8 , D9
P234099
              SMC(S)DIO
                                 4148
                                            D15 ,D17 ,D18 ,D19 ,D20
                                            D1 ,D13 ,D14 ,D6 ,D7
P234140
              SMC(S)DIOSCH
                              LL101A
              SMC(S)DIZEN BZV55C5V6 DMM
                                            D12 ,D16 ,D4
P234164
                                            D2 , D3 , D5
P234172
              SMC(S)DIZENBZX84B5V1SOT23
P234184
              SMC(S)DIZEN BZV55C7V5 DMM
                                            D21
```

P900959

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2.4.6 SCHEMATIC DIAGRAM

2.4.7 BACKBOARD CONNECTIONS

PROCESSOR Board Connector J208 is connected with BACKBOARD Connector J1.

a-side	signal			۱ ۱	c-side	signal	1	
pin nr	name	to	from		pin nr	name	to	from
				(CAD)				
1	NDEGREQP15 oc		ß	33	1	HFLYBP15	F	
2	NMANDEGP15	ß		34	2	TEMPOK		0
3	MISSEL15	F	_	35	3	FOCUS1ADJ	E	
4	NDEGAUSS oc		0	36	4	FOCUS2ADJ	E	
5	EHTOK		E	37	5	+VLED	0	
6	EHTDIS15	E		38	6	-15 V PROTD	@L	
1 7	OSDATA		Lo	39	7	+15 V PROTD	@L	
8	VAMBLSENS		0	40	8	GND	1 1	P
9	(RBIT)GND	0		41	9	RBIT	0	
10	(GBIT)GND	0		42	10	GBIT	0	
11	(BBIT)GND	0		43	11	BBIT	D D	
12	GND		P	44	12	GND	1	P
13	+6.3 V		P	45	13	+6.3 V		P
14	-18 V		P	46	14	-18 V	1 1	P
15	+18 V		P	47	15	+18 V	1 1	P
16	OPTTXDTA	D D		48	16	-6.3 V	l 1	P
17	SDA	DILMO	DILMO	49	17	OPTRXDTA	1	D .
18	GENDIAGN oc/int		ADEILMO	50	18	SCL	DULMO	
19	BSUELIMADJ	A		51	19	GSUELIMADJ	A	
20	GPICADJ		(0)	52	20	RSUELIMADJ	A	
21	BPICADJ	A	u – <i>v</i>	53	21	RPICADJ	A	
22	GHILADJ	A		54	22	RHILADJ	A	
23	BKGADJ		(0)	55	23	BHILADJ	A	
24	GLOLADJ	A	u - <i>v</i>	56	24	RLOLADJ	A	
25	AKBOFF	<u>A</u>		57	25	BLOLADJ	A	
26	BPCLSEL	A A		58	26	EXT10FF		
27	VPOSPOL	~	A	59	27	HPOSPOL		Δ
28	SINT/NAUTOSEL	A	2	60	28	RGBAMPOK		A
29	HFLYBP	23	D	61	29	MVP		D
30	HS/CSP		A	62	30	NVSP		A
31	NuCIRQ int		<u> </u>	63	31	NMBLP	AD	2
32	HWEHTDIS		D	64	32	HWBLANK	20	D

2.4.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

PROC. BOARD FC722 9600

V5631920

Order number of a complete PROC. BOARD FC722 9600: V5631920 01 Date: 01/12/92

Differences between PROC. BOARD 9600 V5631220 and

PROC. BOARD FC722 9600 V5631920 01

ADDED

Order Number Description

Item

V395154

FLUORAD FC - 722

0250

PROC. BOARD H.SEAL 9600

V5631921

Order number of a complete PROC. BOARD H.SEAL 9600: V5631921 00 Date: 01/12/92

Differences between PROC, BOARD 9600 V5631220 and

PROC. BOARD H.SEAL 9600 V5631921 00

ADDED

Order Number Description

Item

V395166

HUMISEAL 1B31

0250

PROC. BOARD CER. FC722 9600

V5631922

Order number of a complete PROC. BOARD CER FC722 9600: V5631922 00 Date: 01/12/92

Differences between PROC, BOARD 9600 V5631220 and

PROC. BOARD CER. FC722 9600 V5631922 00

SUBSTITUTES

Order Number	Description	Item
V5681851	MAIN ADRESS DECODER 00	U215 replaced by
V5681951	MAIN ADRESS DECODER REA00	
V5681861	AUX. ADRESS DECODER 00	U216 replaced by
V5681961	AUX. ADRESS DECODER REA00	
V134257	U 145406 MC DIP16 P	U219 replaced by
V1342571	U 145406 MC DIP16 C	

ADDED

Order Number Description Item V395154 FLUORAD FC722 0250

2.5 POWER SUPPLY BOARD

110/220VAC VERSION

General

This power supply is a half bridge series-resonant converter that generates 5 positive and 5 negative output voltages. It features a very high overall power efficiency.

A jumper selects 115 or 220 VAC mains voltage.

CAUTION

The +6.3 V and -6.3 V outputs are adjusted for +6.0 V and -6.0 V

A sticker on the switch mode indicates the factory set power suppply input voltage.

The identification plate at the rear of the monitor also indicates the factory set power supply input voltage.

Optional Power Supply board versions are described in section 2.5.14 Customized Versions (Options)

2.5.1 IOPC DIAGRAM

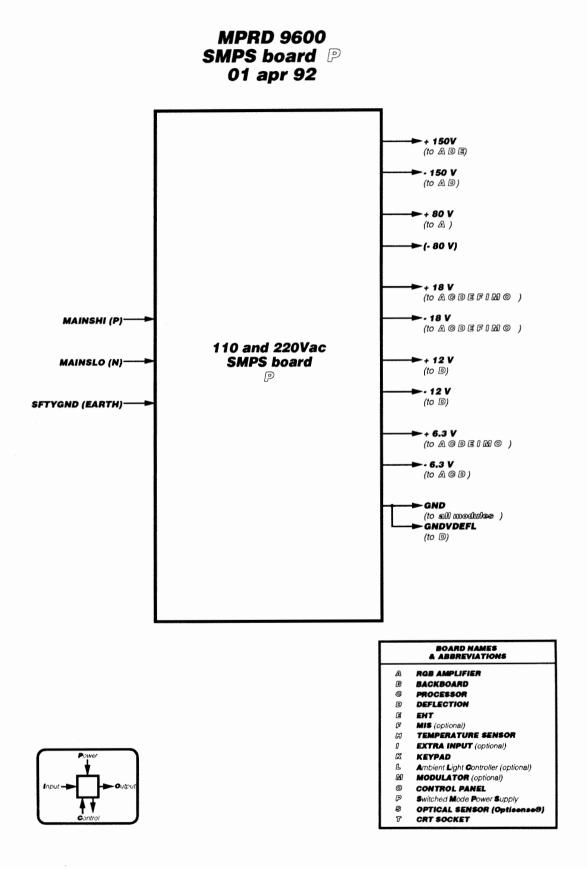


figure 2.37: 110/220VAC POWER SUPPLY IOPC diagram

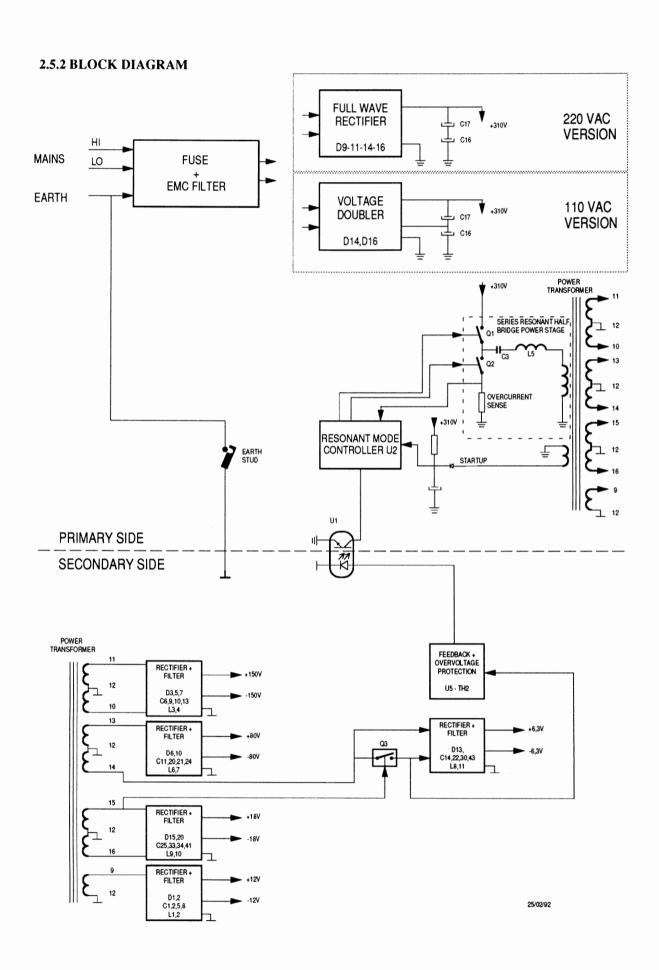


figure 2.38: 110/220VAC POWER SUPPLY board block diagram

2.5.3 CIRCUIT DESCRIPTION

MAINS INPUT - EMC FILTER

T4, C50, C45 and T3 form a two-section filter to suppress differential mode noise. The same two coils with C49, C44 and C48 have the same function for common-mode noise.

The earth-stud in parallel with C46 connects the internal electrical ground (secondary side) with the mains earth. If opened C46 forms a low impedance path for high frequencies. The shunt R30 forms a discharge path in parallel with C46.

MAINS RECTIFICATION

Low Range (90Vac to 135Vac)

Diodes D14 and D16 together with C16 and C17 form a voltage doubler rectification circuit for the input voltage (110Vac nominally). The output voltage will be 310Vdc.

High Range (176Vac to 264Vac)

The four diodes form a double phase rectification bridge for the input voltage (220Vac nominally). Again, the output voltage will be 310Vdc.

PRIMARY SECTION

This section is built around resonant mode controller U2 and the half bridge power stage with Q1,2 that drive transformer T1.

Start-up Circuitry

After switch on C15 will be charged via R7 and R9 from the 310Vdc. As long as the voltage over C15 (Vcc) is less then 16V, the controller is not operating and draws only a minor current from Vcc. At 16V U2 turns on and is powered by the voltage on C15. This voltage on C15 will ramp down whilst energy is taken from it.

The power stage starts operating and all the secondary voltages start rising. Also via the auxiliary winding at pin 3 of power transformer T1 a voltage is generated. This voltage is rectified by D8 and charges C15 back to approx. 13V. Now the supply is at its normal operating level with all secondaries generating their nominal voltage.

Feedback

The feedback signal comes from optocoupler U1 and drives the operational amplifier internal in U2 at its inverting pin nr 7. R26 and C36 between output (pin6) and inverting input (pin7) form a compensation network to stabilise the feedback loop. The RA1 3K3 resistor at output pin6 drives the voltage controlled oscillator input pin3. A rising voltage at pin6 increases the switching frequency.

Overcurrent Protection

Only the positive alternations of the primary current that flow through Q2 are sensed over sense resistors R3 and R4. It is not necessary to sense the other alternations of this current because the series connection of L4 with the load prevents a very rapid build up of the current in case of overload or short circuits. After peak detection and a low pass filtering, the remaining signal is connected to the fault input at pin 10. A level of 1.0 volts switches of the controller. After switch-off the voltage on C15 has to rise again to 16V to start the supply again. So the R9-C15 time constant prevents hiccupping of the supply in case of permanent overload.

SECONDARY SECTION

Seven secondary windings generate the ten different output voltages.

As the transformer T1 is magnetized in both directions, it is possible to generate voltages in several ways:

- two-way rectification with two diodes on a double winding:
 - +150V with D3 (double diode)
 - +18V with D15 (double diode)
 - -150V with D5 and D7
- single winding, for positive and/or negative output voltages, with single wave rectification:
 - +80V with D10
 - -80V with D6
 - -18V with D20
 - +12V with D2
 - -12V with D1
 - -6.0 V with schottky diode D13
 - +6.0V with Q3 as synchronous rectifier driven by the 18V winding.

Each output has its own LC lowpass filter, to reduce the high frequency output ripple to acceptable values.

The +6.3V output is used for feedback via the R12, P1, R36 divider.

D21 is a temperature compensated reference diode.

A fraction of the 6.3V output is compared with the reference voltage for overvoltage protection. When this output reaches approx. 6.85V thyristor Th2 is fired and the shorted 80 V secondary shuts off the supply.

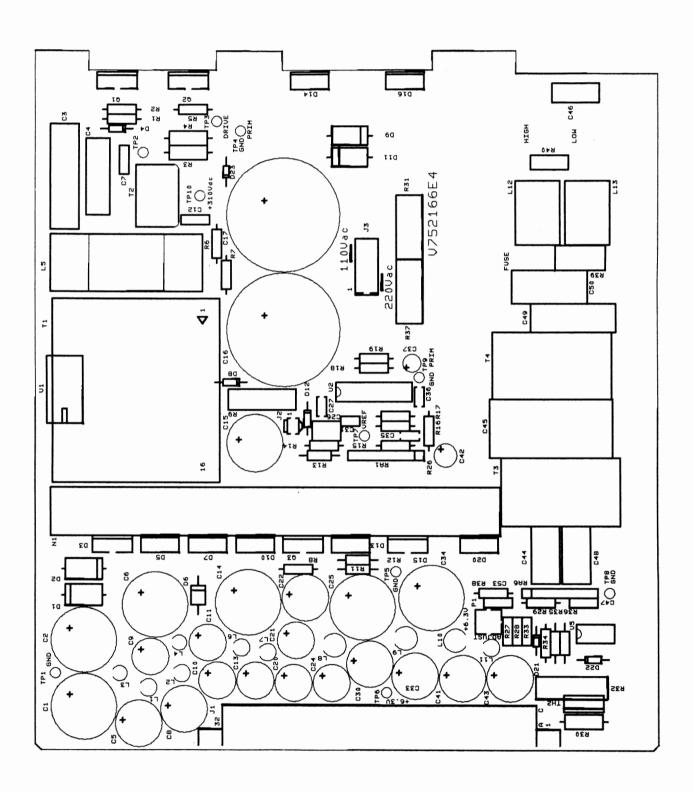


figure 2.39: 110/220VAC POWER SUPPLY board component side

2.5.5 PARTS LIST

Order number of a complete PS 115 V FIX. CORD MPRD9600 : V5631275 11 Date : 30/03/93

0	Г.			T+ om	
Order number		escription		Item	
C1011339	R	CFFH560E J 0W25		R7	
V101213	R	MF H 12E J 0W5		R2	
V101214	R	MF H 15E J 0W5		R5	
V101216	R	MF H 22E J 0W5		R8	
V101227	R	MF H180E J 0W5		R6	
V101229	R	MF H270E J 0W5		R14	
V101234	R	MF H680E J 0W5		R1	
V101236	R	MF H 1K J 0W5		R38	
V101245	R	MF H 5K6 J 0W5		R17	
V101248	R	MF H 10K J 0W5		R28	
V101249	R	MF H 12K J 0W5		R19 ,R34	
V101252	R	MF H 22K J 0W5		R18	
V101253	R	MF H 27K J 0W5		R26	
V101259	R	MF H 82K J 0W5		R29	
V101260	R	MF H100K J 0W5		R15	
V101264	R	MF H220K J 0W5		R16	
V102360	R	MF H100K J 2W		R9	
V1026007	R	MF H 10K F 0W6		R27	
C1026008	R	MF H100K F 0W6		R35	
V1026296	R	MF H 2K F 0W6		R36	
V1026377	R	MF H 24K3 F 0W6		R13	
V1026506	R	MF H 3K32F 0W6		R33	
V1026655	R	MF H475E F 0W6		R12	
V1026657	R	MF H 47K5 F 0W6		R11	
V102900	R	MF H 1E J 1W6		R3 , R4	
V1035993	R		34	R32	
V104665	R	HV H 3M3 J 0W5	3500	R30	
V105011	R	NTC 10E M 1W5		R31	
V105016	R	NTC 4E7 M 1W5		R37	
V107005	R		7 TS	P1	
V1113855	С	EL RA 15M M160E2	105	C20 ,C21	
V1113875	С	EL RA 33M M250E3		C6	
V1114165	С	EL RA 10M M200E2		C10 ,C13	, C9
V1114709	С	EL RA1000M M 16E2			,C30 ,C43
V1114805	С	EL RA1500M M 25E3		C25 ,C34	
V1114825	С	EL RA3300M M 25E3		C1 ,C2	
V1114835	С	EL RA3300M M 10E3		C14	
V111489	С	EL RA 470M M 35E2	105	C33 ,C41	,C5 ,C8
V1114922	С	EL RA 2M2M 50E1		C37	
V1114952	С	EL RA 22M M 50E1		C42	
V1116435	С	EL RA 470M M200E4	105	C16 ,C17	
V1117581	С	CE DI 10N M102E3		C46	
V1122510	С	COG MU 1N J100E2	125	C27	
V1127410	С	X7R MU 1N5K 50E2		C36	
V1127510	С	X7R MU 10N K 50E2	125	C35	
V1127810	С	X7R MU 47N K 50E2		C54	
V1127890	С	X7R MU 470N K 50E2		C12 ,C7	
V1127990	С	X7R MU 100N K100E1		C31	
V1140424	С	POMERA 100N K400E6		C4	
V114089	С	POMERA 150N K 63E2		C47 ,C53	
C1147009	С	CE DI 4N7M400E5		C49 ,R40	
C1147105	С	PO RA 100N M250	X	C50	
C1147169	С	PO RA 1M M250	X	C45	
/	_	10 101 11250	44	0.0	

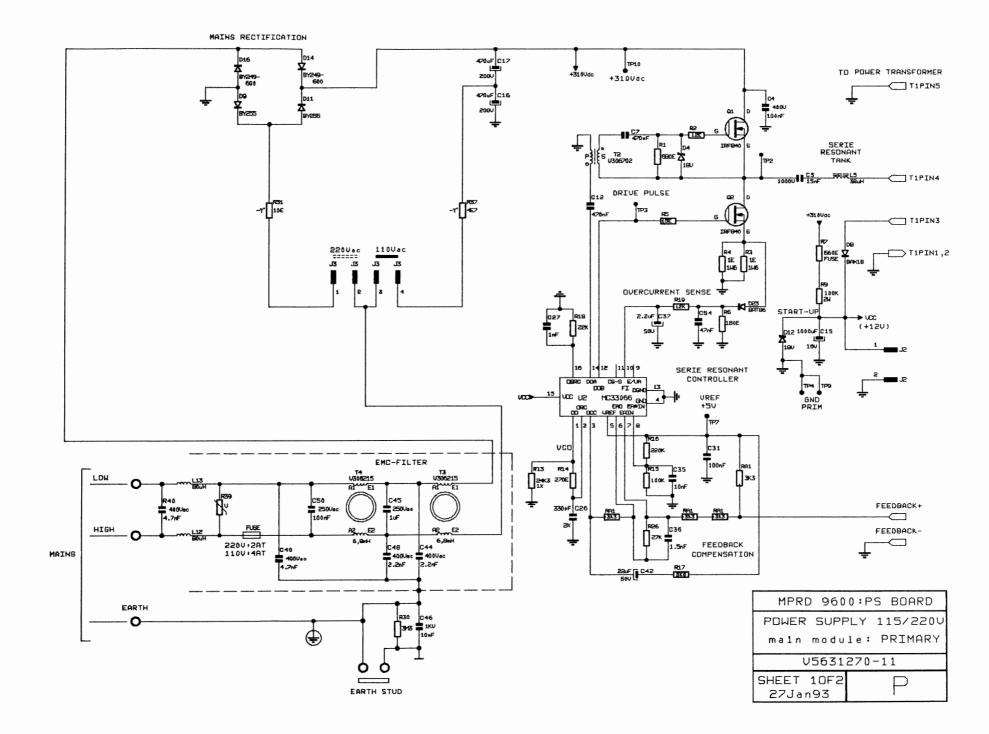
```
Order number Description
                                             Item
              C CE DI
                           2N2M400E5
                                            C44 ,C48
V115014
              С
                 PPMERA 33N J102E9
                                      ΗV
                                            C3
V1151552
              C PP RA 330P H100E2 85
                                            C26
V1315046
              D BAT86
                              SCH DO34
                                             D23
V131624
              D BAX18
                               SW D035
                                             D8
                                             U1
V131697
              U 65B
                                DIP16 P
                         CNY
V1317205
              D 1N823/6V2
                              REF DO34
                                            D21
V131743
              D ZEN
                      8V2 0W5
                               C D035
                                             D2.2
V131749
              D ZEN 18V 0W5 C D035
                                            D12 ,D4
C131902
              D BY255
                                R D013
                                            D11 , D9
V131909
              D PBYR1045
                              SCH TO220
                                            D13
                                            D14 ,D16
V131915
              D BY249-600
                                R T0220
                             UFSR TO220
                                            D10 ,D5
                                                      , D7
V1319496
              D BYV29-400
V131951
              D BYV34-400
                             UFSR TO220
                                            D3
V131952
              D BYV32-200
                             UFSR TO220
                                            D15
              D BYV79-200
                                            D20
V131955
                             UFSR TO220
V132024
              D VSK340
                              SCH
                                            D1
                                                , D2
                                            U5
V1321942
              U 072
                         TL
                                DIP8
                            TH P TO220
                                            TH2
V132211
              Q SO402BH
                            FN P TO220
V132612
              Q IRF840
                                            Q1
                                                 , Q2
V132620
              Q IRF530
                            FN P T0220
                                             03
V133028
              U ACC HTSNK
                                DIP16
                                            0220
              SPR L 8
                                            0040
V133039
                               D 1.2 K
                         D 4
V1330431
              Q ACC ISO ALOX 1.6 TO220
                                             0128
V1377661
              U 33066
                        MC
                                DIP16 I
                                            U2
                        3K3 G 0W3 SIP8
V1508332
              R AI 4
                                            RA1 , RA6
              CORE TUBE 3.5/ 1.3 X 3
C302108
                                            Q'1 ,Q'2
                                            L10 ,L8 ,L9
V302126
              CORE TUBE
                          6 / 3
                                   X18
                                   X18
C302127
                          8 / 4
                                            0148
              CORE TUBE
                           9
V306101
              CH RA NS
                               UH
                                            L7
V3061363
              CH AX S
                          22
                               UH
                                            L1
                                                ,L11 ,L2
V3061402
              CH AX NS
                          47
                               UH
                                            L3
                                                , L4
V306215
              CH MNS
                           6.8 MH 2X 2A2
                                            Т3
                                                 , T4
V306222
              CH TOR V
                           80 UH
                                     2A
                                            L12 ,L13
V306702
              T DVR 2227X
                                             Т2
                                            J3
V3133004
              J MD1
                      MBT P 4 S1SN
V3133021
                       JMP P 1 S1SN
                                             J'3
              J MD
V313525
              J EUR3C MBS P64 E1C2 S1.6
                                            J1
              J DUBX1 MBT P 2 E1AU
V3139132
                                            J2
              F T 4A
C3141041
                          L 5X20 RU/VDE
                                            0131
              F ACC HLDR
                            5X20 FRM
V314512
                                            0130
V315302
              J EYE TEST LG
                                            TP1 , TP10, TP2 , TP3 , TP4 , TP5 ,
                                            TP6 , TP7 , TP8 , TP9
V315331
              SLDRLUG SCR 1TAG D3.2 L12
                                             0147
V315332
              SLDRLUG SCR 1TAG D4.2 L26
                                             0156
V326112
              CBL (AWG18) 3 UL/CSA
                                             0141
V342150
              WIRE AWG22 UL1672 BLA #Y
                                             0132,0133
              SLV SHR D19 /9.5
V346991
                                            L'12,L'13
                                     BLK
              SLV OIL D 0.5
V347001
                                     RED
                                            0290
V3480141
              SLV SHR D 3.2/1.6 L10 BLK
                                             0134
V348016
              SLV SHR D 3.2/1.6 L20 GRN
                                             0146
V348045
              CBL ACC TIE B L280 W3.4
                                             0060
V348060
              CBL ACC CLP FLT
                                             0140
V3620206
              SCR D84
                        M 3 X
                                 5
                                     Τ
                                             0104,0231
                         M 3
V3620216
              SCR D84
                              Χ
                                 6
                                             0102,0121,0126,0212
                                     Ι
V3620226
              SCR D84
                         M 3
                              Χ
                                 8
                                     Ι
                                             0214
C366964
              SCR D933 M 4 X 16
                                     В
                                             0150
```

Order number	Description		Item
C366965	NUT D934 M 4	3	0151
C367384	BSHG SCR M 4		0152
V3673906	WSHR WAVE 3.2	Ι	0103,0122,0127,0213,0217,0232
V367401	RVT D2.4 L 9.1 P A	A	0020
V3675036	WSHR D6798 A 4.3	I	0155
V367650	FIX BRKT UNIVERSAL M3		0101
V3685408	NUT I KSS2 M 3		0233
V395124	GLUE LOCTITE 384		0250
V395322	EMC SEAL D3.2		0280
C600145	MASSA SUPPORT	01	0154
V6030961	CAPTIVE SCREW M3 X 8	0 0	0105
V6030963	CAPTIVE SCREW SPRING	01	0106
V6030964	CAPTIVE SCREW M3 X10	00	0108
V603569	KLEM TRANSISTOR 3L	00	0107,0210
V6035692	KLEMTRANSISTOR 2L	00	0125,0211
V6036126	HEATSINK SM HE308P3 20F	103	0100
V603614	HEATSINK SMPS REC. \$\$\$	01	0200
V603696	ISOLATION SMPS REC.	00	0215
V6036971	BACK ISOLATION 220V	02	0123
V6036991	SMPS SHIELD 220V	03	0230
V603731	PCB CLAMP MPRD9000	01	0216
V752166	PCB SMPS 115/220V 9000	02	0010
V775328	CH TOR V 38 UH		L5
V775336	TRF SMPS 115/220V 9000	00	T1

NOTE FOR 220V AC VERSION ONLY

FUSE must be a 2 A T type.

2.5.6 SCHEMATIC DIAGRAM



28VDC VERSION

General

This power supply consists of two converters in cascade. The first converter is a step-up (boost) converter, with duty cycle modulation at approximately 100Kc, that converts any input voltage between 18Vdc and 40Vdc to a fixed output voltage of 67Vdc. This stabilised voltage forms the input to the second converter which is a resonant mode converter switching around 250Kc.

The advantages of this cascade of two converters are:

- a very wide range of input voltages, the supply is able to accept any voltage between 18Vdc and 60Vdc (for the complete monitor the operating range is 20Vdc to 40Vdc)
- a high efficiency over the complete range of input voltages.

CAUTION

The +6.3 V and -6.3 V outputs are adjusted for +6.0 V and -6.0 V

Optional Power Supply board versions are described in section 2.5.14 Customized Versions (Options)

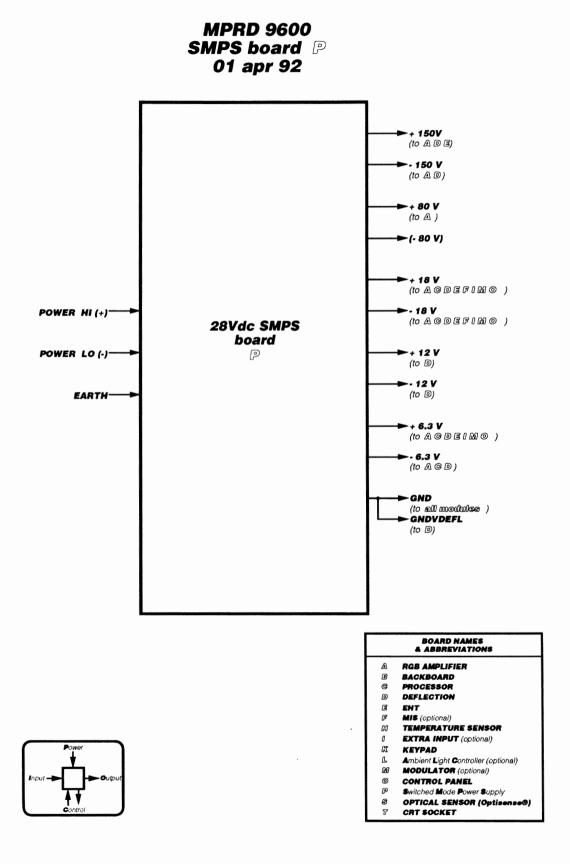


figure 2.40: 28VDC POWER SUPPLY board IOPC diagram

2.5.8 BLOCK DIAGRAM

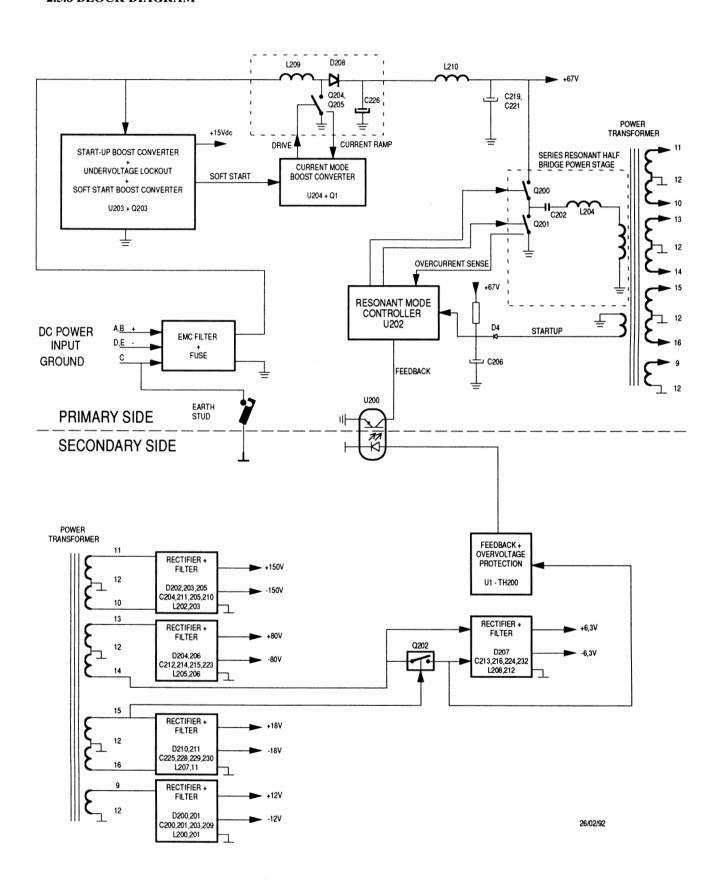


figure 2.41: 28VDC POWER SUPPLY board block diagram

2.5.9 CIRCUIT DESCRIPTION

POWER INPUT - EMC FILTER

L213,214 together with C234,238 form a filter to suppress differential mode noise. The same coils with C236,237, 239,240 have the same function for common-mode noise.

The earth-stud in parallel with C235 connects the internal electrical ground (secondary side) to earth. If opened C235 forms a low impedance path for high frequencies. The shunt R203 forms a discharge path in parallel with C235.

BOOST CONVERTER

Power Stage

The power switch consist of the parallel combination of two sense-powerfets Q204,205. These form together with L209,D208 and C226 a basic boost converter.

Control Circuitry

The power switch is duty cycle modulated at approximately 100 Kc by controller U204. This is a current mode controller. The current ramp is sensed at the sense contacts of Q205 and Q204 in parallel, and via a low pass filter R41-C16 connected to the current sense input of U204. Via emitter follower Q1 a fraction of the oscillator ramp voltage on C13 is added to the current sense wave form. This is called slope compensation and is needed for feedback stabilisation in any boost converter that operates at duty cycles over 50%. The output voltage is divided by R28,21 and via low pass R22-C11 connected to the inverting input at pin2 for feedback stabilisation. R40 and C14 stabilise the closed loop.

Undervoltage Lockout and Start-up

One half of U203 senses the value of the input voltage. At values above 18V pin7 goes high and the +15V at the emitter of Q203 powers the boost controller U204. As soon as the voltage goes below 17,5V the emitter of Q203 returns to zero and the boost converter stops (undervoltage lockout).

At each switch-on, the second part of U203 generates a soft start pulse that is injected in the feedback loop via R24 and D9. The pulse duration is determined by charging C231 via R39.

SERIES RESONANT HALF BRIDGE CONVERTER

This section is built around resonant mode controller U202 and the half bridge power stage with Q200,201 that drive transformer T1.

Start-up Circuitry

After switch on C206 will be charged via R8 and R200 from the 67Vdc. As long as the voltage over C206 (Vcc) is less then 16V, the controller is not operating and draws only a minor current from Vcc. At 16V U202 turns on and is powered by the voltage on C206. This voltage on C206 will ramp down whilst energy is taken from it.

The power stage starts operating and all the secondary voltages start rising. Also via the auxiliary winding at pin3 of power transformer T200 a voltage is generated. This voltage is rectified by D4 and charges C206 back to approx. 13V. Now the supply is at its normal operating level with all secondaries generating their nominal voltage.

Feedback

The feedback signal comes from optocoupler U200 and drives the operational amplifier internal in U202 at its inverting pin7. R15 and C8 between output (pin6) and inverting input (pin7) form a compensation network to stabilise the feedback loop. The R16 resistor at output pin6 drives the voltage controlled oscillator input pin3. A rising voltage at pin6 increases the switching frequency.

Overcurrent Protection

Only the positive alternations of the primary current that flow through Q4 are sensed over sense resistors R8 and R9. It is not necessary to sense the other alternations of this current because the series connection of L4 with the load prevent a very rapid build up of the current in case of overload or short circuits.

The low sense voltage between current-sense and kelvin source pins of Q201 is differentially amplified by U201. After peak detection a low pass filter R9,C9 extracts the average value, and connects this average voltage to the fault

input at pin10. A level of 1.0 volts switches of the controller. After switch-off the voltage on C206 has to rise again to 16V to start the supply again. So the R8-C206 time constant prevents hiccupping of the supply in case of permanent overload.

SECONDARY SECTION

Seven secondary windings generate the ten different output voltages.

As the transformer T1 is magnetized in both directions, it is possible to generate voltages in several ways:

- two-way rectification with two diodes on a double winding:
 - +150V with D202 (double diode).
 - +18V with D210 (double diode).
 - -150V with D203 and D205.
- -single winding, for positive and/or negative output voltages, with single wave rectification:
 - +80V with D206.
 - 80V with D204.
 - -18V with D211.
 - +12V with D201.
 - 12V with D200.
 - 6.0V with schottky diode D207.
 - +6.0V with Q202 as synchronous rectifier driven by the 18V winding.

Each output has its own LC lowpass filter, to reduce the high frequency output ripple to acceptable values.

The +6.3V output is used for feedback via the R25, P200, R58 divider.

D209 is a temperature compensated reference diode.

A fraction of the 6.3V output is compared with the reference voltage for overvoltage protection. When this output reaches approx. 6.85V thyristor Th200 is fired and the shorted 18V secondary shuts off the supply.

2.5.10 PCB LAYOUT

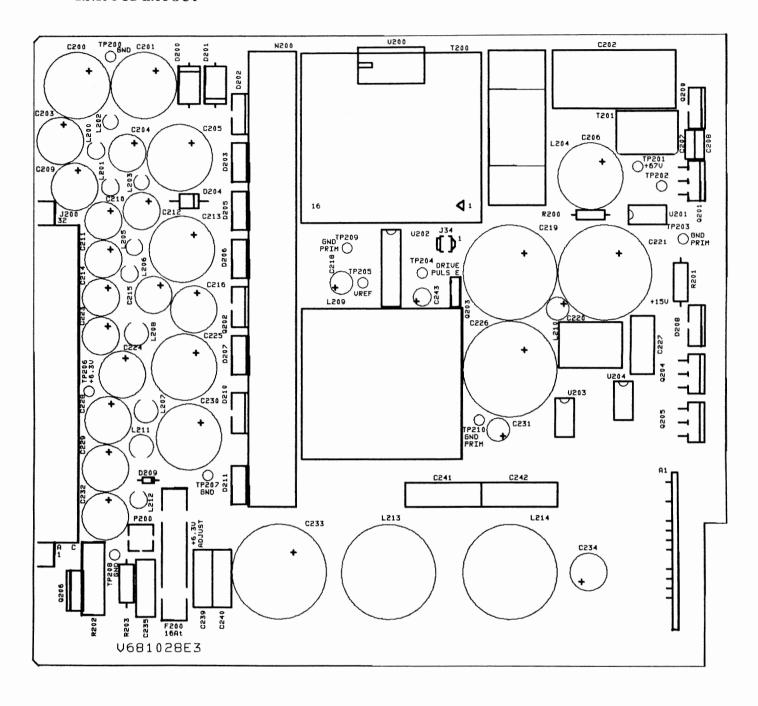


figure 2.42: 28VDC POWER SUPPLY board component side

figure 2.43: 28VDC POWER SUPPLY submodule FILTER component side

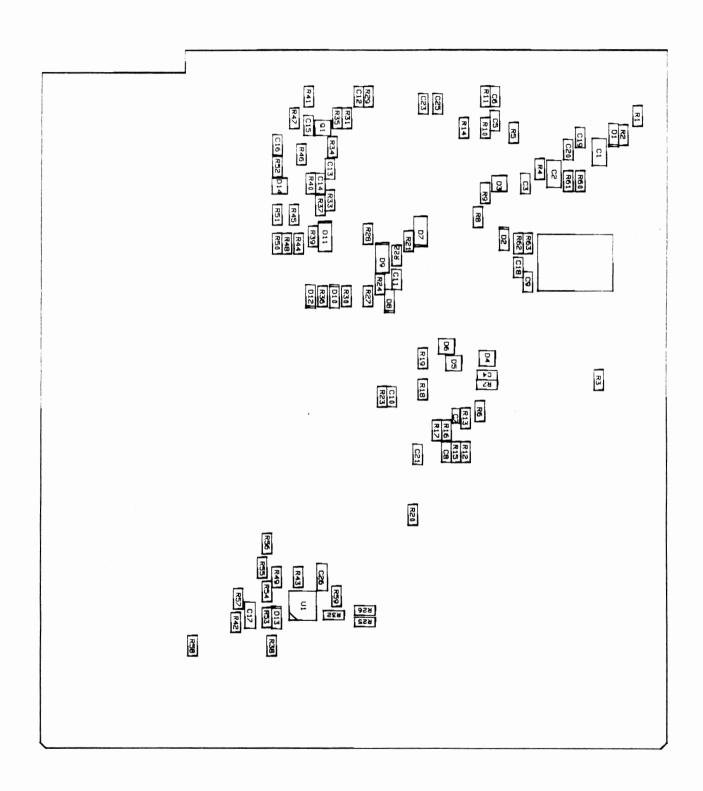


figure 2.44: 28VDC POWER SUPPLY board solder side

2.5.11 PARTSLIST

Order number of a complete 28 V DC POWER SUPPLY BOARD: V5631271 12 Date: 26/01/93

0	Description	Thom
Order number	Description	Item
C1011339	R CFFH560E J 0W25	R200
V102909	R MF H 5E6 J 1W6	R201
V1035993	R WW R 4E7 K 2W E4	R202
V104654	R HV H 1M J 0W5 3500	R203
V107005	R TCE H500E M 0W5 S7 TS	P200 .
V1113855	C EL RA 15M M160E2 105	C214,C215
V1113875	C EL RA 33M M250E3 105	C205
V1114165	C EL RA 10M M200E2 105	C204,C210,C211
V1114709	C EL RA1000M M 16E2 105	C216,C224,C232
V111471	C EL RA1000M M 25E3 105	C206
V1114762	C EL RA 47M M 25E1 105	C220,C231
V1114805	C EL RA1500M M 25E3 105	C225,C230
V1114825	C EL RA3300M M 25E3 105	C200,C201
V1114835	C EL RA3300M M 10E3 105	C213
V111489	C EL RA 470M M 35E2 105	C203,C209,C228,C229
V1114942	C EL RA 10M M 50E1 105	C243
V1114952	C EL RA 22M M 50E1 105	C218
V1114985	C EL RA 470M M 63E3 105	C234
V111600	C EL RA1500M M100E4 105	C219, C221, C226, C233
V1127030	C X7R MU 100N K200E2 125	C207,C208
V1127930	C X7R MU 1M K 50E2 125	C238
V1140309	C POMERA 10N K630E4 85	C235
V1140409	C POMERA 68N K630E6 85	C236, C237, C241, C242
V1140462	C POMERA 220N K100E4 85	C227
V115019	C PPMERA 150N K400E11 HV	C202
V1314361	Q BD139 N P TO126	Q203
V1314301 V131697	U 65B CNY DIP16 P	U200
V1317205	D 1N823/6V2 REF DO34	D209
V1317203 V131909	D PBYR1045 SCH TO220	D207
V1319496	D BYV29-400 UFSR TO220	D203, D205, D206
V1319496 V131951	D BYV34-400 UFSR TO220	D203, D203, D200
		D202 D208, D210
V131952		D208, D210 D211
V131955	D BYV79-200 UFSR TO220	
V132024	D VSK340 SCH	D200, D201
V132211	Q SO402BH TH P TO220	Q206
V132611	Q IRF540 FN P TO220	Q200
V132620	Q IRF530 FN P TO220	Q202
V132633	Q MTP10N10M FN P TO220	Q201,Q204,Q205
V133028	U ACC HTSNK DIP16	0220
V133039	SPR L 8 D 4 D 1.2 K	0250
V1330431	Q ACC INSUL ALOX TO220	0123
V134120	U 3140 CA DIP8 P	U201
V1341431	U 062I TL DIP8 I	U203
V1377661	U 33066 MC DIP16 I	U202
V1377691	U 2843 UC DIP8 I	U204
V302109	CORE TUBE 2.6/ 1.2 X 1.6	L217
V302126	CORE TUBE 6 / 3 X18	L207, L208, L211
V306101	CH AX NS 9 UH	L206, L215, L216
V3061363	CH AX S 22 UH	L200, L201, L212
V3061402	CH AX NS 47 UH	L202,L203
V306222	CH TOR V 80 UH 2A	L210
V306702	T DVR 2227X	T201
V3132841	J CIS MBS P20 R1SN	J11
V313525	J EUR3C MBS P64 E1C2 S1.6	J200
V3136740	J RND_M FBT P 5 15/05 HSG	J1
V3139132	J DUBX1 MBT P 2 E1AU	J34

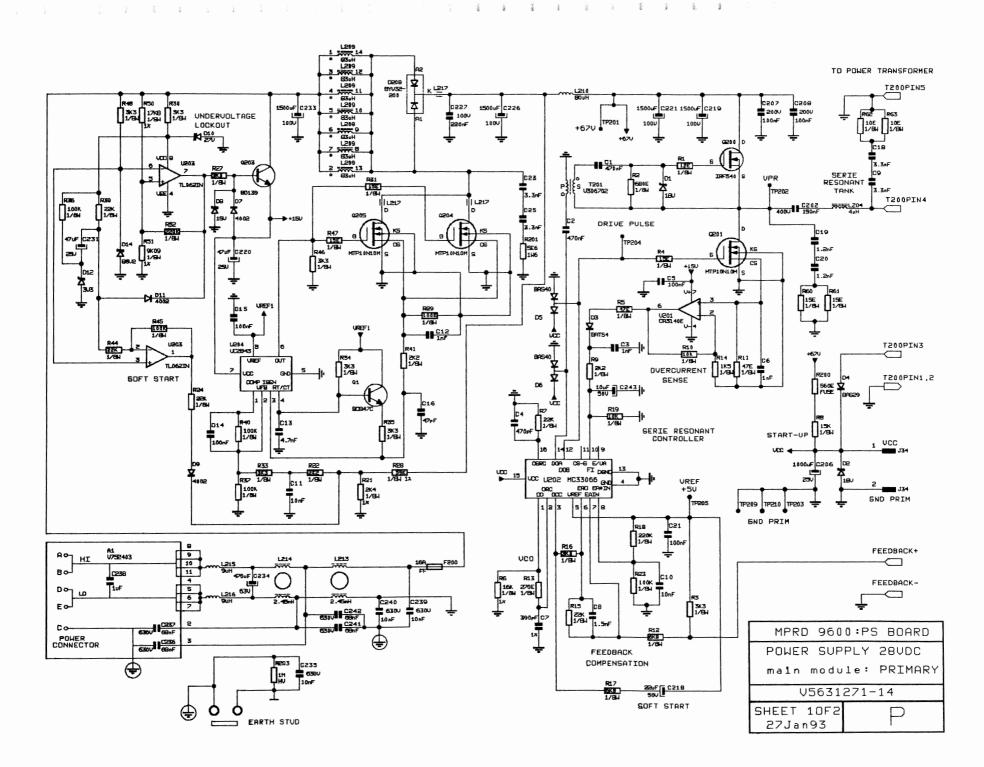
```
Order number Description
                                       Item
           F FF16A
                      H 6X32
                                       0030
V314504
            F ACC HLDR T UNIV PC/CPL
                                       F200
V315302
            J EYE TEST LG
                                       TP
V315332
            SLDRLUG SCR 1TAG D4.2 L26
                                       0156
V347001
            SLE OIL 0.5
                        RED N
                                       0290
C347053
            SLE SHR 6.0 3:1 BLA
                                       L200, L202
V348006
            CABLE TIE B2.5L140
                                       0240
V3620146
           SCR D84
                    M 2.5X 10 I
                                       0020
V3620206
            SCR D84
                    M 3 X 5 I
                                       0104,0231
V3620216
            SCR D84
                     M 3 X 6
                               I
                                       0102,0121,0141,0212
                     M 3 X 8
V3620226
            SCR D84
                                 I
                                       0214
                     M 3 X 10
            SCR D84
V3620236
                                Ι
                                       0143
V3620276
            SCR D84
                    M 3 X 20 I
                                      0272
V3620316
            SCR D84
                      M 3 X 35 I
                                      0260
V3661026
           NUT D934
                     M 3
                               I
                                      0262
V3661106
            NUT D934
                       M 2.5
                                       0022
                                Τ
V366940
            SPR I L 1.5 M 3 T1.5 S T
                                       0273
            SCR D933 M 4 X 16 B
C366964
                                       0150
C366965
            NUT D934
                      M 4
                                 В
                                       0157
C367384
                                       0152
            BSHG SCR M 4
V3673896
            WSHR D137A 2.7
                                       0021
                               Ι
V3673906
            WSHR WAVE 3.2
                               I
                                       0103,0122,0142,0213,0217,0232,
                                       0261,0271
V3673916
            WSHR WAVE 4.3
                                       0158
                                Т
V3675036
            WSHR D6798 A 4.3
                                 Ι
                                       0155
            FIX BRKT UNIVERSAL M3
V367650
                                       0101
V3685408
            NUT I KSS2 M 3
                                       0233
            SPR RVT L12
V3685496
                             M3 I
                                      0144
V395124
            GLUE LOCTITE 384
                                       0221
V395322
            EMC SEAL D3.2
                                       0280
C600145
            MASSA SUPPORT
                                 01
                                       0154
V6030961
            CAPTIVE SCREW M3 X 8
                                 00
                                       0110
V6030963
            CAPTIVE SCREW SPRING
                                 01
                                       0111
V6030964
            CAPTIVE SCREW M3 X10
                                 00
                                       0112
            PLASTIC WASHER
                                  00
                                      0270
V603154
V603569
            KLEM TRANSISTOR 3L
                                  00
                                      0120,0210
            KLEMTRANSISTOR 2L
V6035692
                                  00
                                       0124,0211
            HEATSINK SM HE308P5 20H02
V6036125
                                       0100
V603614
            HEATSINK SMPS REC. $$$ 01
                                       0200
V603696
            ISOLATION SMPS REC.
                                 00
                                       0215
V603699
            SMPS SHIELD 28V
                                  03
                                       0230
V603731
            PCB CLAMP MPRD9000
                                 01
                                       0216
V681028
                                      0010
            SMD SMPS 28V MPRD9600 06
V752403
            PCB FILTER MODULE 9000 02
                                      A1
V7753281
            CH TO V 4.6 UH
                                  0.1
                                      L204
V775334
             CORE SMPS 80 UH 9000 00
                                      L209
                            9000 00
V775337
            TRF SMPS 28V DC
                                       T200
V775353
             COIL TOROID 2.45MH 02
                                       L213, L214
```

Order number of a complete SMD 28 V DC: V681028 Date: 27/01/93

Order number	Description	Item	
P200025	R# CE H 10E J 0W12 1206	R62 ,R63	
P200027	R# CE H 12E J 0W12 1206	R1	
P200029	R# CE H 15E J 0W12 1206	R31 ,R47 ,R60 ,R61 ,R4	
P200033	R# CE H 22E J 0W12 1206	R20	
P200041	R# CE H 47E J 0W12 1206	R11 R5	

```
Order number Description
                                             Item
P200049
              R# CE H100E
                           J 0W12 1206
                                             R29
P200059
              R# CE H270E
                           J 0W12 1206
                                             R13
                                             R2
P200069
              R# CE H680E
                           J 0W12 1206
                                             R59
                            J 0W12 1206
P200073
              R# CE H
                        1K
                                             R14
P200077
              R# CE H
                        1K5 J 0W12 1206
P200081
              R# CE H
                        2K2 J 0W12 1206
                                             R22 ,R41 ,R9
                                             R16 ,R27 ,R3
P200085
              R# CE H
                       3K3 J 0W12 1206
                                                           ,R30 ,R33 ,R34 ,
                                             R35 ,R38 ,R46 ,R48 ,R53 ,R56 ,
                                             R57
                                             R12 ,R17
P200093
              R# CE H 6K8 J 0W12 1206
              R# CE H 10K
                           J 0W12 1206
                                             R10 ,R19 ,R49
P200097
                                             R55
              R# CE H 12K
                            J 0W12 1206
P200099
              R# CE H 15K
                            J 0W12 1206
                                             R8
P200101
                                             R15 ,R24 ,R39 ,R44 ,R7
              R# CE H 22K
                            J 0W12 1206
P200105
              R# CE H 82K
                           J 0W12 1206
                                             R43
P200119
              R# CE H100K
                           J 0W12 1206
                                             R23 ,R36 ,R37 ,R40 ,R45
P200121
P200129
              R# CE H220K
                           J 0W12 1206
                                             R18 , R52
                                             R58
                           F 0W12 1206
P200418
              R# CE H
                       2K
                       2K4 F 0W12 1206
                                             R21
P200420
              R# CE H
P200435
              R# CE H 10K
                           F 0W12 1206
                                             R54
                           F 0W12 1206
                                             R6
P200440
              R# CE H 16K
              R# CE H100K
                           F 0W12 1206
                                             R32
P200459
              R# CE H475E
                           F 0W12 1206
                                             R25
P206257
P206338
              R# CE H
                       3K32F 0W12 1206
                                             R42
              R# CE H
                       9K09F 0W12 1206
                                             R51
P206380
P206408
              R# CE H 17K8 F 0W12 1206
                                             R50
              R# CE H 47K5 F 0W12 1206
                                             R26
P206449
              R# CE H 59K F 0W12 1206
                                             R28
P206458
                                                ,C2
                                             C1
P210002
              C(S)CEC2CH1812X7R474M 50
P210013
              C(S)CEC1CH1206COG102J 50
                                             C12 ,C3
                                                      , C6
P210028
              C(S)CEC1CH1206COG152J 50
                                             C8
                                             C17 ,C26
              C(S)CEC2CH1808X7R154K 50
P210048
P210055
              C(S)CEC1CH0805COG391F 50
                                             C7
P210092
              C(S)CEC2CH1206X7R103K 50
                                             C10 ,C11
              C(S)CEC1CH1206COG470J 50
                                             C16
P210100
              C(S)CEC1CH1206COG471J 50
                                             C4
P210102
              C(S)CEC1CH1206COG122J 50
                                             C19 ,C20
P210112
              C(S)CEC2CH1206X7R104K 50
                                             C14 ,C15 ,C21 ,C5
P210122
              C(S)CEC2CH1206X7R472K 50
                                             C13
P210140
                                             C18 ,C23 ,C25 ,C9
P210150
              C(S)CEC2CH1206X7R332K 50
                                             U1
P230054
              SMC(S)ICLOPA
                               TL072I
                                             Q1
P232104
              SMC(S)TRNPN BC847C SOT23
                                                 , D6
                                             D5
                             BAS40-04
P234003
              SMC(S)DIO
P234021
              SMC(S)DIOZEN
                             BZV55C18
                                             D1
                                                 , D2
                                             D4
P234034
              SMC(S)DIO
                                BAS29
                                             D14
P234037
              SMC(S)DIOZEN BZX84B6V2
                            BZV55C15
                                             D8
P234051
              SMC(S)DIOZEN
                                BAT54
                                             D3
P234055
              SMC(S)DIO
P234056
              SMC(S)DIOREC
                                 4002
                                             D11 ,D7
                                                      , D9
P234057
              SMC(S)DIOZEN BZV55C8V2
                                             D13
P234185
                                             D10
              SMC(S)DIZEN BZV55C27 DMM
P234213
              SMC(S)DIZEN BZV55C3V3 DMM
                                             D12
              PRINT - P1386042
                                             S
P905042
```

2.5.12 SCHEMATIC DIAGRAM



2.5.13 BACKBOARD CONNECTIONS

110/220~V~AC~POWER~SUPPLY~Board~Connector~J1~or~28~V~DC~POWER~SUPPLY~Board~Connector~J200~is~connected~with~BACKBOARD~Connector~J4.

c-side pin nr	signal	4. 4	a-side	signal		4
pin nr	name	to from	pin nr	name	to	from
32	-12 V	[D]	20	·12 V		
31	nc/ntbu	ש	32 31	nc/ntbu	D	000000000000000000000000000000000000000
30	+12 V	D	30	+12 V	D	
29	nc/ntbu	٧	29	nc/ntbu	ש	
28	+150 V	ADE	28	+150 V	ADE	
27	nc/ntbu	عاقلا	27	nc/ntbu	قاقات	
26	-150 V	AD	26	-150 V	AD	
25	nc/ntbu		25	nc/ntbu	23	
24	GNDVDEFL	D	24	GNDVDEFL	D	300000000000000000000000000000000000000
23	GNDVDEFL	D	23	GNDVDEFL	D	ı
22	GNDVDEFL	D	22	GNDVDEFL	D	ı
21	nc/ntbu		21	nc/ntbu		
20	+80 V	A	20	+80 V	A	***************************************
19	+80 V	A	19	+80 V	A	
18	nc/ntbu		18	nc/ntbu		
17	-80 V	nu	17	-80 V	nu	
16	nc/ntbu		16	nc/ntbu		
15	GND	a00	15	GND	න ැට	
14	GND	a 00	14	GND	<i>5</i> 000	
13	GND	කැගි	13	GND	ର ଥା	
12	GND	a 010	12	GND	න 00	- 1
11	+6.3 V / A	Δ	11	+6.3 V / A	Δ	1
10	+6.3 V	GDEILMO	10	+6.3 V	<u>CDEILMO</u>	
9	-18 V	agdefim	9	-18 V	acdefim	ŀ
8	-18 V	acdefim	8	-18 V	acdefim	l
1 7	GND	න 00	7	GND	all	
6	GND	න 00	6	GND	add	
5	+18 V	agdefim	5	+18 V	AGDEFIM	
4	+18 V	acdefim	4	+18 V	acdefim	
3	-6.3 V	ADI	3	-6.3 V	ADI	
2	-6.3 V	ADI	2	-6.3 V	ADI	
1	SFTYGND		1	SFTYGND	L	

2.5.14 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

115 V AC CUSTOMER VERSIONS

PS 115V P3 RGD V5631270

Order number of a complete PS 115 V P3 RGD : V5631270 08 Date : 30/03/93 Differences between PS 115 V F.CORD RGD V5631275 and PS 115 V P3 RGD V5631270

SUBSTITUTES

Order Number	Description	Item
V348060	CBL ACC CLP FLT	0140 replaced by
V313670	J RND_M FWT P 3 09/98 HSG	
V326112	CBL (AWG18) 3 UL/CSA	0141 replaced by
V3620216	SCR D84 M3 X 6 D I	
ADDED		
01 271		
Order Number	Description	Item
V3673906	Description WSHR WAVE 3.2	Item 0142
	-	
V3673906	WSHR WAVE 3.2	0142
V3673906 V342150	WSHR WAVE 3.2 WIRE AWG22 UL1672 BLA	0142 0143

PS 115V P3 FC722 9600 V5631970

Order number of a complete PS 115V P3 FC722 9600 : V5631970 01 Date : 01/12/92 Differences between PS 115V P3 9600 V5631270 and PS 115V P3 FC722 9600 V5631970 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

PS 115V P12-3 MPRD9600 V5631972 (READ IMPORTANT NOTICE !!)

Order number of a complete PS 115V P12-3 $\,$ MPRD9600 : V5631972 00 $\,$ Date : 01/12/92 Differences between PS 115V P3 9600 V5631270 and

PS 115V P12-3 MPRD9600 V5631972 00

SUBSTITUTES

Order Number	Description		Item		
V6036126	HEATSINK SM HE308P3 20H	03	0100	replaced	by
V6036129	HEATSINK SM HE301P3/20	00			
V313670	J RND_M FWT P 3 09/98 HSG		0140	replaced	by
V313952	J RND_M FCT P 3 12-03 HSG				
V6036991	SMPS SHIELD 220V	03	0230	replaced	by
V6036992	SMPS SHIELD HE301/20	00			
ADDED					
Order Number	Description		Item		
V6037184	SMPS 220V ISOLATION		0235		
V367434	RIV.P AL D2.4 L 3.2		0300		

PS 115V P12-3 H.SEAL V5631973 (READ IMPORTANT NOTICE !!)

Order number of a complete PS 115V P12-3 H.SEAL 9600 : V5631973 00 Date : 01/12/92 Differences between PS 115V P3 MPRD9600 V5631270 and PS 115V P12-3 H.SEAL 9600 V5631973 00

SUBSTITUTES

Order Number	Description		Item	
V6036126	HEATSINK SM HE308P3 20H	03	0100	replaced by
V6036129	HEATSINK SM HE301P3/20	00		
V313670	J RND_M FWT P 3 09/98 HSG		0140	replaced by
V313952	J RND_M FCT P 3 12-03 HSG			
V6036991	SMPS SHIELD 220V	03	0230	replaced by
V6036992	SMPS SHIELD HE301/20	00		
ADDED				
Order Number	Description		Item	
V6037184	SMPS 220V ISOLATION		0235	
V367434	RIV.P AL D2.4 L 3.2		0236	
V395166	HUMISEAL 1B31		0300	

IMPORTANT NOTICE

The power supplies with order number V5631972 and V5631972 have another type of power connector, this connector is wired in a different way. Refer to drawing below for correct connection.

pin A: 115/220 V AC LIVE (fused)

pin B: GROUND

pin C: 115/220 V AC NEUTRAL



PS 115/SW FC722 9600 V5631974

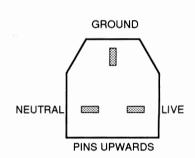
Order number of a complete PS 115/SW FC722 9600 : V5631974 00 Date : 01/12/92 Differences between PS 115 F.CORD MPRD9600 V5631275 and PS 115V/SW F.CORD FC722 9600 V5631974 00

SUBSTITUTES

Order Number	Description		Item	
V6036126	HEATSINK SM HE308P3	03	0100	replaced by
V6036120	HEATSINK HE308/SWITCH	00		
V326112	CBL (AWG18) 3 UL/CSA		0141	replaced by
V326123	CD MNS BS/IEC 2.0M 5A			
V6036991	SMPS SHIELD 220V	03	0230	replaced by
V603829	SMPS SHIELD POW.SWITCH	00		

ADDED

Order Number	Description	Item
V603828	HOLDER POWER SWITCH	0240
V324701	SW MNS JPZ 2M TV5 WS	0241
K721990	KNOB PUSH D BLA FS	0242
V3620216	SMP-I AM3 X 6 D 84	0243
V3673906	WASHER CRINCKLE I M3	0244
V395154	FLUORAD FC - 722	0300



PS 115V F.CORD FC722 9600 V5631975

Order number of a complete PS 115V F.CORD FC722 9600 : V5631975 00 Date : 01/12/92 Differences between PS 115V F.CORD MPRD9600 V5631275 and PS 115V F.CORD MPRD9600 V5631975 00

SUBSTITUTES

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

PS 115 P3 T.SENSOR V5631279

Order number of a complete PS 115 P3 T.SENSOR: V5631279 02 Date: 08/01/93 Differences between PS 115V P3 MPRD9600 V5631270 and PS 115 P3 T.SENSOR V5631279 02

SUBSTITUTES

Order Number	Description	Item
V6036126	HEATSINK SM HE308P3 20H03	0100 replaced by
V6036128	HEATSINK SM HE308/20 01	
V314512	F ACC HLDR 5X20 FRM	0130 replaced by
C348101	W JUMP 0.6 5	
V603614	HEATSINK SMPS REC.§§§ 01	0200 replaced by
V6036141	HEATS SMPS REC.TS §§§ 00	

ADDED

Order Number	Description	Item
V311097	F 10A 90C THERMO	0260
V3620226	SCR D84 M 3 X 8 I	0261
V3673906	WSHR WAVE 3.2 I	0262
V3661026	NUT D934 M3 I	0263
V3480141	SLE SHR 3.2 L10 BLA	0264
V326112	CBL (AWG18) 3 UL/CSA	0266
V348060	CABLE CLAMP LFT	0270
C348003	GROMMET T1.5 D 9.5	0271

REMOVED

Item

0130, 0131, 0132, 0133, 0134

28 V DC CUSTOMER VERSIONS

PS 28V P5 FC722 9600 V5631971

Order number of a complete PS 28V P5 FC722 9600 : V5631971 01 Date : 01/12/92 Differences between PS 28V P5 9600 V5631271 and PS 28V P5 FC722 9600 V5631971 01

SUBSTITUTES

Order Number	Description	Item
V6036125	HEATSINK SM HE308P5 20H02	0100 replaced by
V6036124	HEATSINK SM HE308P5 FL 04	

PS 28V P5 FC722 9600 V5631971

Order number of a complete PS 28V P5 FC722 9600 : V5631971 01 Date : 01/12/92 Differences between PS 28V P5 9600 V5631271 and PS 28V P5 FC722 9600 V5631971 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

2.6 CONTROL PANEL BOARD

General

I²C circuitry scans the keys and drives the leds. Two leds OVERTEMP and FAULT are driven by parallel control lines.

Optional Control Panel board versions are described in section 2.6.8 Customized Versions (Options)

MPRD 9600 CONTROL PANEL board © 01 apr 92

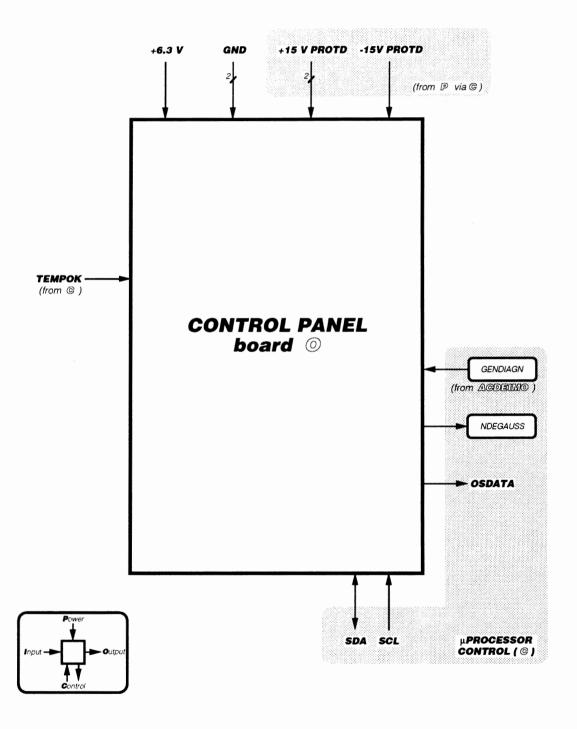


figure 2.45: CONTROL PANEL board IOPC diagram

2.6.2 BLOCK DIAGRAM

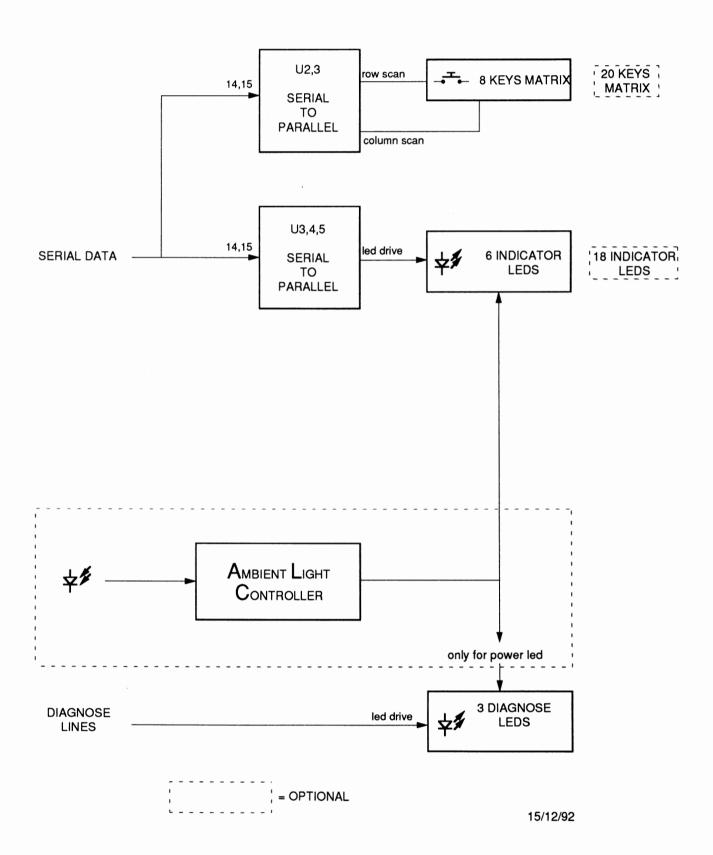


figure 2.46: CONTROL PANEL board block diagram

2.6.3 CIRCUIT DESCRIPTION

The left hand side of the circuit diagram shows the internal connections between the control board and the MPRD 9600 (plug J1), the right hand side shows the external connections to the OPTISENSE® HEAD (plug J2).

The I²C lines, SCL and SDA, are protected by D10,11,12,13 and R4,5. U2 and U3 receive both lines but they have different addresses, determined by pins1,2,3.

U2 scans the keyboard (8 push buttons, 4colums x 2 rows); U3 drives 6 indicator leds D4-9.

The circuits are powered by U1, this is a low drop voltage regulator stabilizing the +6.3V.

The POWERLED D1 lights if +6.3V is present, the OVERTEMP LED D2 and FAULT LED are driven by two parallel control lines.

2.6.3.1 Optional version with function keys and ambient light controller

J1, pin1,3,5,7,15,16 (on the left hand side of the circuit diagram) and J2 pin1,4,5,6,7,8,9 (at the right hand side) shows the connections from the MPRD 9651 control board to the OPTISENSE® HEAD.

The I²C lines, SCL and SDA, are protected by D32,33,34,35 and R20,21. U2,3,4,5 receive both lines but they have different addresses, determined by pin1,2,3 of each of them.

Part of U2 and U3 scan the keyboard (20 push buttons, 5 columns x 4 rows). Part of U2 and U3 also drive indicator leds D4,5,14,15,16,17.

Part of U2, part of U3, U4 and U5 drive indicator leds D4 - 25.

The circuits are powered by U1, this is a low drop voltage regulator stabilizing the +6.3V.

The POWERLED D1 lights if +6.3V is present, the OVERTEMP LED D2 and FAULT LED are driven by two parallel control lines.

AMBIENT LIGHT CONTROLLER

The ambient light is sensed by the light sensors D26,27. The more light falling on the sensors, the higher the output voltage at U6,pin6 will be. U7 adapts the regulation curve to the eye sensitivity curve by changing the amplification according to the input voltage. This is realized through the zener diodes D28,29,30. At pin 6 leaves a lowering voltage for increasing ambient light.

Low to high voltage transients are smoothed by the RC network R14-C10. From high to low faster switching is realised by D31 and the RC network R15-C10. The result is a fast increase of the contrast for a dark-to-light ambient light transition and a delayed decrease of the contrast for a light-to-dark ambient light transition.

Buffered by U8, UAMBLSENS leaves the board at J1,pin4.

If the ALC is switched on, UAMBLSENS is used to modulate +VLED, +VLED supplies power to all indicator leds, except for the OVERTEMPLED and the FAULTLED.

2.6.5 PARTS LIST

Order number of a complete	CONTROL PANEL	STD: V5631260 01	Date: 01/12/92
----------------------------	---------------	------------------	----------------

Order number	Description	Item
V101224	R MF H100E J 0W5	R4 ,R5
V101234	R MF H680E J 0W5	R1 ,R2 ,R3
V1127830	C X7R MU 100N K 50E2 125	C2 ,C3
V1127890	C X7R MU 470N K 50E2 125	C1
V131627	D BAV21 SW DO35	D10 ,D11 ,D12 ,D13
V131667	D LED D3 T GRE	D1
V131670	D LED D3 T YEL HLMP	D4 ,D5 ,D6 ,D7 ,D8 ,D9
V131671	D LED D3 T RED HLMP	D2 , D3
V1330145	Q ACC MOUNTING PAD TO18	0040
V134044	U 2940-5 LM TO220 P	U1
V1372951	U 8574A PCF DIP16 P	U2 ,U3
V1405472	R AB 4 4K7 G 0W2 SIP5	AR1 ,AR4
V1508561	R AI 4 560E G 0W3 SIP8	AR2 ,AR3
V3110631	D ACC HLDR D3 P1 T H 4.8	0030
V3132068	J MD2 MBT P16 E1AU	J1
V3135017	J DE T8 FPT P 9 FT M	J2
V324198	SW PUSH 1M BT	0020
V3571031	KNOB PUSH D7.8/1.4 TR. #Y	0021
V3620226	SMP-I AM3 X 8 D 84	0060
V3661026	NUT DIN934 I M3	0062
V3673906	WASHER CRINKLE I M3	0061
V3685466	STANDOFF M3- 8 INOX	0070
V752178	PCB CONTR.STD MPRD9651 01	0010

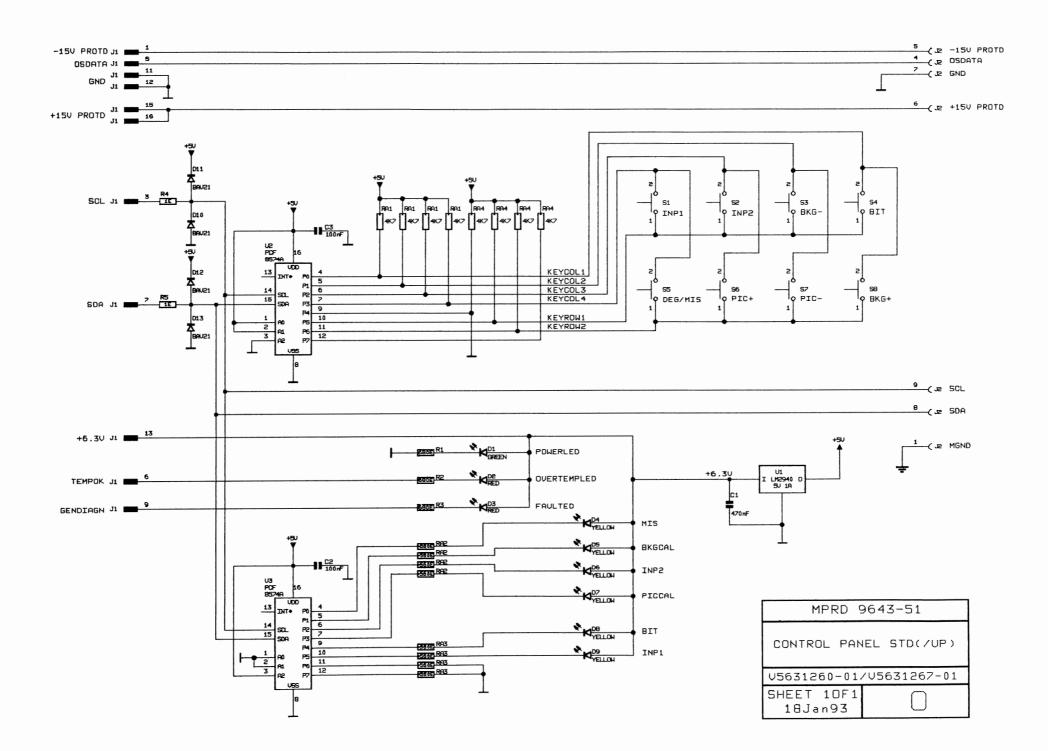
OPTIONAL VERSION WITH FUNCTION KEYS

Order number of a complete CON. PAN. FKEYS 51L: V5631261 00 Date: 01/12/92

Order number	Description	Item
V101224	R MF H100E J 0W5	R20 ,R21
V101233	R MF H560E J 0W5	R18 ,R19
V101234	R MF H680E J 0W5	R1 ,R2 ,R3
V101239	R MF H 1K8 J 0W5	R10
V101244	R MF H 4K7 J 0W5	R16 ,R17 ,R8 ,R9
V101248	R MF H 10K J 0W5	R6 ,R7
V101250	R MF H 15K J 0W5	R15
V101252	R MF H 22K J 0W5	R12
V101253	R MF H 27K J 0W5	R4 , R5
V101260	R MF H100K J 0W5	R14
V101275	R MF H 1M8 J 0W5	R13
V1026680	R MF H 5K11F 0W6	R11
V111197	C EL AX 4M7M100E7 105	C10
V1114942	C EL RA 10M M 50E1 105	C4
V1127830	C X7R MU 100N K 50E2 125	C1 ,C2 ,C3 ,C5 ,C6 ,C7 ,
		C8 ,C9
V1127890	C X7R MU 470N K 50E2 125	C11
V1316211	D 1N4148 SW DO35	D31
V131627	D BAV21 SW DO35	D032,D033,D034,D035
V131667	D LED D3 T GRE	D1

```
Order number Description
                                         Item
V131670
             D LED D3
                                         D10 ,D11 ,D12 ,D13 ,D14 ,D15 ,
                         T YEL HLMP
                                         D16 ,D17 ,D18 ,D19 ,D20 ,D21 ,
                                         D22 ,D23 ,D24 ,D25 ,D4 ,D5 ,
                                         D6 ,D7 ,D8 ,D9
V131671
             D LED D3
                                         D2 ,D3
                         T RED HLMP
V131694
            D BPW21
                          РНО ТО56 І
                                         D26 ,D27
                   6V2 0W5 C DO35
            D ZEN
                                         D29
C131720
V131729
             D ZEN
                     4V7 0W5 C DO35
                                         D30
                     8V2 0W5 C DO35
V131743
             D ZEN
                                         D28
                             DIP8
V1321942
             U 072
                    \mathtt{TL}
                                         U8
V1330136
             Q ACC MOUNTING PAD TO5
                                         0050
             Q ACC MOUNTING PAD TO18
V1330145
                                         0040
V134044
             U 2940-5 LM
                             TO220 P
                                         U1
V1341220
             U 07
                       OP
                              DIP8 I
                                         U6 ,U7
V1372951
             U 8574A PCF
                             DIP16 P
                                         U2 ,U3 ,U4 ,U5
                                         RA1 ,RA2
V1405472
             R AB 4 4K7 G 0W2 SIP5
V1508561
             R AI 4 560E G 0W3 SIP8
                                         RA3 ,RA4 ,RA5 ,RA6 ,RA7
V3110631
             D ACC HLDR D3 P1 T H 4.8
                                         0030
V3132068
             J MD2 MBT P16 E1AU
                                         J1
V3135017
             J DE T8 FPT P 9 FT M
                                         J2
V324198
             SW PUSH 1M BT
                                         0020
V3571031
             KNOB PUSH D7.8/1.4 TR. #Y
                                         0021
             SMP-I AM3 X 8 D 84
V3620226
                                         0060
V3661026
             NUT DIN934 I M3
                                         0062
V3673906
             WASHER CRINKLE I M3
                                         0063
V3685466
             STANDOFF M3- 8 INOX
                                         0070
V752179
             PCB CONTR.F.K.MPRD9651L00
                                         0010
```

2.6.6 SCHEMATIC DIAGRAM



2.6.7 BACKBOARD CONNECTIONS

CONTROL PANEL Board Connector J1 is connected with BACKBOARD Connector J7 by a 16 pins flatcable.

pin nr	signal name	to	from
1	-15V PROTD		G
2	+VLED		G
3	SCL		G
4	VAMBLSENS	G	
5	OSDATA	GL	
6	TEMPOK	GH.	
7	SDA	GDILM	@DILM
8	ABKGADJ	A(G)	
9	GENDIAGN oc/int	© (G	ADEILM
10	APICADJ	A(G)	
11	GND	, ,	P
12	GND		P
13	+6.3 V		P
14	NDEGAUSS oc	G	
15	+15V PROTD		G
16	+15V PROTD		G

note1: pin10 = APICADJ (= GPICADJ from Microprocessor Module C)

note1 : pin8 = ABKGADJ (= BKGADJ from Microprocessor Module C)

2.6.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

CON. PAN. UP MPRD 9600 V5631267

Order number of a complete CON. PAN. UP 9600: V5631267 01 Date: 12/01/93 Differences between CONTROL PANEL STD V5631260 and CON. PAN. UP 9600 V5631267 01

SUBSTITUTES

Order Number Description Item

V752178 PCB CONTR.STD MPRD9651 01 0010 replaced by

V752181 PCB CONTR.UP MPRD9651 00

CON. PAN. F.KEYS 9643L V5631265

Order number of a complete CON. PAN. F.KEYS 9643L: V5631265 00 Date: 01/12/92 Differences between CON. PAN. F.KEYS 9651L V5631261 and CON. PAN. F.KEYS 9643L V5631265 00

SUBSTITUTES

Order Number Description Item

V752179 PCB CONTR.F.K.MPRD9651L00 0010 replaced by

V752181 PCB CONTR.F.K.MPRD9643L01

CONTROL STD FC722 9600 V5631960

Order number of a complete CONTROL STD FC722 9600 : V5631960 00 Date : 01/12/92 Differences between CONTROL STD 9600 V5631260 and CONTROL STD FC722 9600 V5631960 00

ADDED

Order Number Description Item V395154 FLUORAD FC - 722 0100

CONTROL FK.FC722 9651L V5631961

Order number of a complete CONTROL FK. FC722 9651L: V5631961 00 Date: 01/12/92 Differences between CON, PAN, F.KEYS 9651L V5631261 and CONTROL FK. FC722 9651L V5631961 00

ADDED

Order Number Description

Item

V395154

FLUORAD FC - 722

0100

CONTROL STD HSEAL 9600 V5631962

Order number of a complete CONTROL STD HSEAL: V5631962 00 Date: 01/12/92 Differences between CONTROL STD 9600 V5631260 and CONTROL STD HSEAL 9600 V5631962 00

ADDED

Order Number Description

Item

V395166

HUMISEAL 1B31

0100

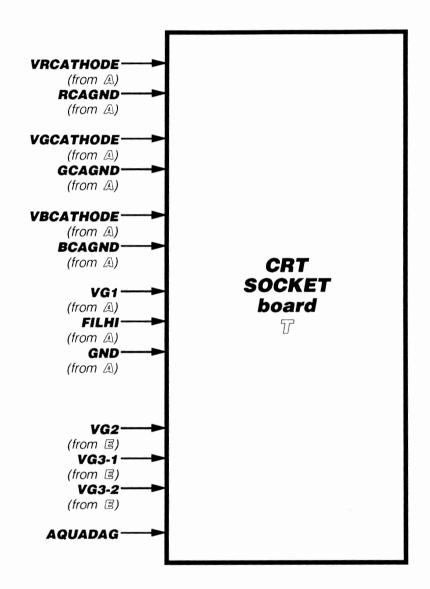
2.7 CRT SOCKET

General

The CRT socket connects RGB and FOCUS signals, filament power, ground and AQUADAG to the CRT.

Optional CRT Socket versions are described in section 2.7.5 Customized Versions (Options)

MPRD 9600 CRT SOCKET board 7 26 febr 92



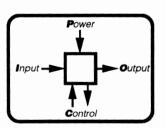
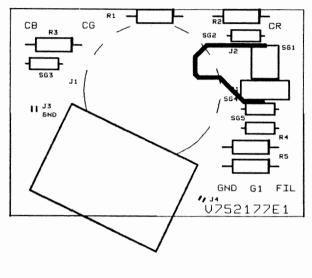
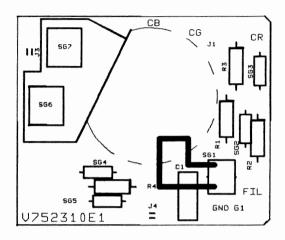


figure 2.48: CRT SOCKET board IOPC diagram

2.7.2 PCB LAYOUT





LANDSCAPE

PORTRAIT

figure 2.49: CRT SOCKET board component side

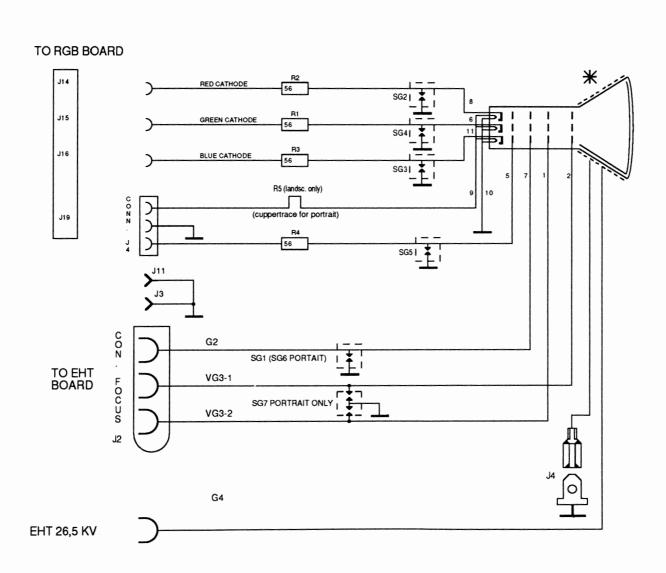
2.7.3 PARTS LIST

Order number of a complete CRT SOCKET: V5631280 02 Date: 01/12/92

Order number	Description	Item
V102021	R CC H 56E K 0W5	R1 ,R2 ,R3 ,R4
V1117581	C CE DI 10N M102E3 HV	C1
V1312621	TUBE SURGE PROTECT 1000V	SG1
V131265	TUBE SURGE PROTECT 200V	SG2 ,SG3 ,SG4 ,SG5
V311037	J CRT FBT B10-301 SKT	J1
V3139142	J DUBX1 FWT P 2 E1 HSG	0020
V3139144	J DUBX1 FWT P 3 E1 HSG	0030
V313931	J DUBX FWT P 1 30/22	0024,0034
V315314	J RVT FBT P 1	J10 ,J5 ,J6 ,J7 ,J8 ,J9
V315319	J TAB1 MBT H 6.3S0.8	J4
V315353	J TAB1 MBS H 2.8S0.5	J11 ,J3
V326306	CD HV ALDEN_1X FWT P 3	0040
V342168	WIRE AWG24 UL1007 WHI Y	0021,0022,0023,0031,0032,0033
V3481064	W JUMP 0.6 17.78	R5
V752177	PCB CRT SOCKET 9000 01	0010

2.7.4 SCHEMATIC DIAGRAM

MPRD9600 CRT SOCKET 15/12/92



2.7.5 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

CRT SOCKET P MPRD 9600 V5631282

Order number of a complete CRT SOCKET P MPRD9600 : V5631282 01 Date : 01/12/92 Differences between CRT SOCKET MPRD9600 V5631280 and CRT SOCKET P MPRD9600 V5631282 01

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. \$\$\$ 00		
V752177	PCB CRT SOCKET 9000 01	0010	replaced by
V752310	PCB CRT SOCKET P 9000 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

REMOVED

Item

R5

CRT SKT EXT ALT9600 V5631285

Order number of a complete CRT SKT EXT ALT9600 : V5631285 00 Date : 01/12/92 Differences between CRT SOCKET MPRD9600 V5631280 and CRT SKT EXT ALT9600 V5631285 00

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. \$\$\$ 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

CRT SOCKET P MPRD 9600 V5631282

Order number of a complete CRT SOCKET FC722 9600 : V5631980 00 Date : 01/12/92 Differences between CRT SOCKET MPRD9600 V5631280 and CRT SOCKET FC722 9600 V5631980 00

ADDED

Order Number Description Item V395154 FLUORAD FC - 722 0100

CRT SKT P HSEAL 9600 V5631981

Order number of a complete CRT SKT P HSEAL9600 : V5631981 00 Date : 01/12/92 Differences between CRT SOCKET MPRD9600 V5631280 and CRT SKT P HSEAL9600 V5631981 00

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. \$\$\$ 00		
V752177	PCB CRT SOCKET 9000 01	0010	replaced by
V752310	PCB CRT SOCKET P 9000 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060
V395166	HUMISEAL 1B31	100

REMOVED

Item R5

2.8 TEMPERATURE SENSOR

General

The MPRD9600 is thermally protected by a temperature sensor.

If the internal monitor temperature exceeds 90°C the contact in the sensor will close, the OVERTEMP LED on the front panel will light; the microprocesor board will disable the EHT. The AKB module will detect zero beamcurrent, the FAULT LED on the front panel will also light.

A warning appears on the keypad:

WARNING:

OVERTEMP

2.8.1 IOPC DIAGRAM

MPRD 9600 TEMPERATURE SENSOR # 26 febr 92

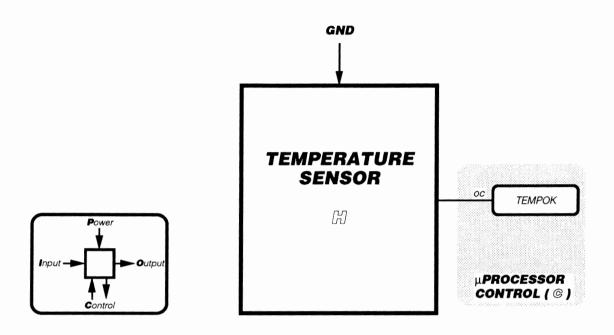


figure 2.50: TEMPERATURE SENSOR IOPC diagram

2.8.2 TEMPERATURE SENSOR CONNECTIONS

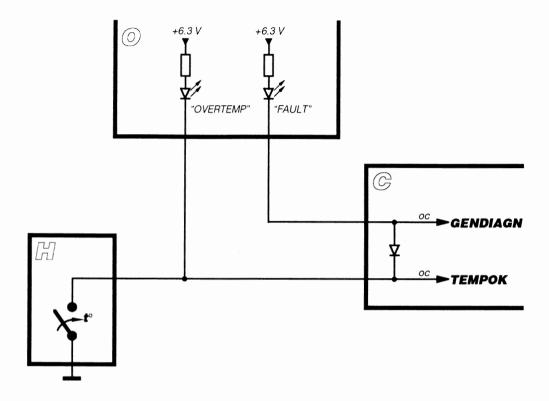


figure 2.51: TEMPERATURE SENSOR connections

2.8.3 PARTS LIST

The temperature sensor, wiring, plugs, etc. can be found in the parts list of the FRAME V5631180; this parts list can be found in paragraph 2.11 OTHER PARTS LISTS.

2.8.4 BACKBOARD CONNECTIONS

TEMPEATURE SENSOR wires are connected to BACKBOARD Connector J9.

pin nr	signal name	to	from
1 2	TEMPOK GND	G	P

2.9 BACKBOARD

General

Most of the wirings between plug-in units go via the backboard.

All other wirings are described in chapter 3 Interconnections.

Optional Backboard versions are described in section 2.9.4 Customized Versions (Options)

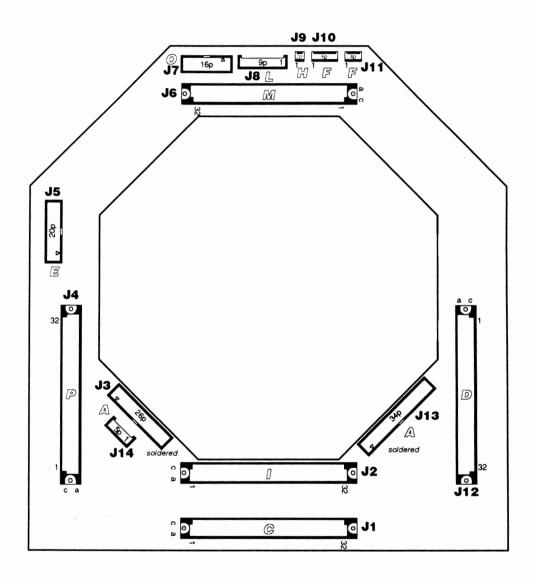


figure 2.52: BACKBOARD component side

2.9.2 PARTS LIST

Order number of a complete BACKBOARD : V5631200 00 Date : 01/12/92

Order number	Description	Item
V313480	J FLT2 MBT P20 E1AU	J5
V313484	J FLT2 MBT P16 E1AU	J7
V313526	J EUR3C FBT P64 E1C2 S1.6	J1 ,J12 ,J2 ,J4 ,J6
V3139132	J DUBX1 MBT P 2 E1AU	J9
V3139133	J DUBX1 MBT P 4 E1AU	J11
V3139135	J DUBX1 MBT P 6 E1AU	J10
V3492531	CORD FLAT P26 230MM 00	J3
V3493339	CORD FLAT P34 230MM 00	J13
V367400	RIV. AL D2.4 L 5.9	0030
V3685466	STANDOFF M3- 8 INOX	0020
V752157	BACKBOARD (PCB) 9000 00	0010

2.9.3 CONNECTIONS OVERVIEW

2.9.4 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

BACKBOARD FC722 9600 V5631900

Order number of a complete BACKBOARD FC722 9600 : V5631900 00 Date : 01/12/92 Differences between BACKBOARD MPRD9600 V5631200 and BACKBOARD FC722 9600 V5631900 00

ADDED

Order Number Description Item V395154 FLUORAD FC - 722 0100

BACKBOARD H.SEAL 9600 V5631901

Order number of a complete BACKBOARD H.SEAL 9600: V5631901 00 Date: 01/12/92 Differences between BACKBOARD MPRD9600 V5631200 and BACKBOARD H.SEAL 9600 V5631901 00

ADDED

Order Number Description Item V395166 HUMISEAL 1B31 100

2.10 SOFTWARE

The real-time software on the processor board is split up in different parts.

* KEYSCAN : Scans the keys (of keypad and control panel)

*Dacrefresh : Refreshes the DACs on the processor board

* E^2 PROM : Supports reading in and writing to E^2 PROM

Sends parameters to the deflection board

* LTC : Life Time Counter

Automatic Degauss

Orbitting

Secondary watchdog

* Treescan : Processes all data

Kernal

* RScom : Supports communication

Automatic colour calibration

* Watchdog : Controls all processes

Controls events

* Scanset : Selects scan set parameters

* Gend : General diagnostic (active if FAULT led lights)

* Mid : Interrupt controller

The software on the deflection board sets the deflection parameters, receives parameters from the processor board, measures the horizontal and vertical deflection frequency and triggers the degauss circuit if requested by the processor board.

2.11 OTHER PARTSLISTS

Order number of a complete FRONT 20" L STD: V5631130	0 0	Date: 01/12/92
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Order number	Description	Item
V3120056	SPG CMP 8 X24.5/0.63 I	0031
K3135033	J D ACC SCR_L U/M L 8	0050
V3620106	SMP-I AM2.5X 5 D 84	0011
V3620676	SMP-I AM 5X12 D84	0041
V3622126	SMC-MI 3X 6 D963	0027
V3673926	WASHER CRINKLE I M5	0042
V395326	NEOPRENE SPONSRUBBER D6	0100
V600478	HANDLE TRIM RGCD \$\$\$ 00	0040
V6005273	FLTR ND50% EMI-EMC 03	0025
V603260	CUP CAPT M6	0030
V603594	SEAL CHASSIS 00	0050
V6035953	SEAL FILTERFRAME 20 00	0026
V603678	STANDARD LABEL L&P 01	0010
V6036922	CAPT.BOLTM6 X 45 SW8 00	0033
V603782	BEZEL SET 9651L 00	0020

Order number of a complete FRONT 17" L STD: V5631135 00 Date: 01/12/92

Order number	Description	Item
V3120056	SPG CMP 8 X24.5/0.63 I	0031
K3135033	J D ACC SCR_L U/M L 8	0050
V3620106	SMP-I AM2.5X 5 D 84	0011
V3620676	SMP-I AM 5X12 D84	0041
V3622126	SMC-MI 3X 6 D963	0027
V3673926	WASHER CRINKLE I M5	0042
V395326	NEOPRENE SPONSRUBBER D6	0100
V600478	HANDLE TRIM RGCD \$\$\$ 00	0040
V603260	CUP CAPT M6	0030
V603594	SEAL CHASSIS 00	0050
V6035954	SEAL FILTERFRAME 17 00	0026
V603598	FLTR AR 60% EMC 9643 00	0025
V603678	STANDARD LABEL L&P 01	0010
V6036922	CAPT.BOLTM6 X 45 SW8 00	0033
V6037831	BEZEL SET 9643L 00	0020

Order number of a complete FRAME UN. STD: V5631180 00 Date: 01/12/92

Order number	Description	Item
V311099	F 2A 90C THERMO	0010
V3139142	J DUBX1 FWT P 2 E1 HSG	0015
V342168	WIRE AWG24 UL1007 WHI Y	0014
V348014	SLE SHR 3.2 L20 BLA Y	0013
V3480211	W ACC CLIP 3.2	0800
V348029	GROMMET PANEL 2MM Y	0082
V348073	KABELCLIPS TWIST #Y	0081
V3495417	WIRE UNIT RG179 400 00	0090
V358137	PCB GUIDE L 162 #Y	0021
V3581372	PCB GUIDE L 76 #Y	0022
V3581381	PCB GUIDE L 56 #Y	0023

Order number	Description		Item
V3620196	SMP-I AM3 X 4 D 84		0011
V3620216	SMP-I AM3 X 6 D 84		0100,0120
V3620236	SCR DIN84 M 3 X 10	Ι	0101
V3620516	SMP-I AM 4X 8 D 84		0130
V3620526	SMP-I AM 4X10 D84		0230
V3673766	WASHER PA I 3.2 D125		0111
V3673906	WASHER CRINKLE I M3		0012,0102,0121
V3673916	WASHER CRINKLE I M4		0131,0231
V367434	RIV.P AL D2.4 L 3.2		0150,0151
V3674566	RIV.P IN D3.2 L 6.4		0036
V591034	LABEL DANGER 37X18		0140
V6030961	CAPTIVE SCREW M3 X 8	00	0041,0061,0071
V6030963	CAPTIVE SCREW SPRING	01	0032,0042,0062,0072
V6030964	CAPTIVE SCREW M3 X10	00	0033,0043
V6030965	CAPTIVE SCREW M3 X13	00	0031,0044
V603588	FRAME	05	0020
V603589	TOPCOVER	01	0040
V6035923	SEC. INPUT BLANC	00	0060
V603641	EHT CON PLATE	00	0070
V603642	BACKCOVER	03	0030
V6036421	HEATSINK BACKCOVER	02	0035
V6036422	HEATSINK POW.BACKCOVER	00	0035
V603731	PCB CLAMP MPRD9000	01	0110
V7502827	IDENT PLAAT NSN 6551A	00	0150

Order number of a complete PICT. TUBE UN. STD 20 ": V5636190 00 Date: 11/05/93

Order number	Description	Item
V131178	CRT HT51-669-ITC	0100
V3133062	J MNL FWT P 1 AU24/18	0102,0132
V3133072	J MNL P NWT P 2 HSG	0131
V3133077	J MNL P NWT P 9 HSG	0101
V342199	WIRE AWG18 UL1007 GRY Y	0103,0104
V348000	CBL ACC TIE B L 98 W2.5	0025,0133
V348001	CBL ACC TIE B L172 W4.6	0122
V348027	GROMMET CONTINUOUS #Y	0024
V348072	CBL ACC TIE FIX TM2S6	0011
V3494613	CORD FLAT P16 700MM 00	0160
V3496361	WIRE UN HV 40KV UL3239 00	0110
V3622136	SCR D963 M 3 X 8 I	0021,0090
V3622266	SCR D963 M 4 X 12 I	0032
V3623332	SCR D933 M 5 X 16 S B	0105
V3661026	NUT D934 M 3 I	0022
V3673766	WSHR D125 A 3.2 I	0013
V3673816	WSHR D440R 5.5 I	0107
V3673906	WSHR WAVE 3.2 I	0023
V3674546	RVT POP D3.2 L 6.7 P II	0012
V3675046	WSHR D6798 A 5.3	0106
V367529	WSHR D 5.1 X17.9 T0.8 D	0108
V395156	SILICONE RTV 3140	0112
V395467	TAPE GLASS UL 1" UL	0121
V5900101	LABEL BVC FCC PART15	0191
V590225	LAB CAUTION HIGH	0190
V603605	SHIELD 20" 02	0010
V603607	SHIELD TRIM 20" 01	0020

Order number	Description		Item
V6036884	CRT FIX.(MILLING)LEFT	01	0070
V6036885	CRT FIX.(MILLING)RIGHT	01	0071
V603824	SHIELD STIF.CRT SIDE	00	0091
V6038241	SHIELD STIF.CRT TOP	00	0092
V603825	SHIELD STIF.BEZEL SIDE	00	0030
V6038251	SHIELD STIF.BEZEL TOP	00	0031
C660193	UN AKWADAG CD 351	01	0120
V670024	SPO DEGAUSS 6551A/1	02	0130

Order number of a complete PICT. TUBE UN. STD 17": V5636195 00 Date: 11/05/93

Order number	Descritpion	Item
V131179	CRT M41KXH900X 02	0100
V3133062	J MNL FWT P 1 AU24/18	0102,0132
V3133072	J MNL P NWT P 2 HSG	0131
V3133077	J MNL P NWT P 9 HSG	0101
V342199	WIRE AWG18 UL1007 GRY Y	0103,0104
V348000	CBL ACC TIE B L 98 W2.5	0025,0133
V348001	CBL ACC TIE B L172 W4.6	0122
V348072	CBL ACC TIE FIX TM2S6	0011
V3494613	CORD FLAT P16 700MM 00	0160
V3496361	WIRE UN HV 40KV UL3239 00	0110
V3622136	SCR D963 M 3 X 8 I	0021,0090
V3622266	SCR D963 M 4 X 12 I	0032
V3623332	SCR D933 M 5 X 16 S B	0105
V3661026	NUT D934 M 3 I	0022
V3673766	WSHR D125 A 3.2 I	0013
V3673816	WSHR D440R 5.5 I	0107
V3673906	WSHR WAVE 3.2 I	0023
V367 4 546	RVT POP D3.2 L 6.7 P II	0012
V3675046	WSHR D6798 A 5.3 I	0106
V367529	WSHR D 5.1 X17.9 T0.8 D	0108
V395156	SILICONE RTV 3140	0112
V395467	TAPE GLASS UL 1" UL	0121
V4121015	UN W AQUADAG 3/37 02	0120
V5900101	LABEL BVC FCC PART15	0191
V590225	LAB CAUTION HIGH	0190
V603604	SHIELD 17" 01	0010
V603606	SHIELD TRIM 17" 01	0020
V6036884	CRT FIX.(MILLING)LEFT 01	0070
V6036885	CRT FIX.(MILLING)RIGHT 01	0800
V6038241	SHIELD STIF.CRT TOP 00	0092
V603825	SHIELD STIF.BEZEL SIDE 00	0030
V6038252	SHIELD STIF.BEZEL TOP 01	0031
V670025	SPO DEGAUSS 6537A/1 01	0130

Order number of a complete RACKMOUNT KIT 20": V5631290 00 Date: 01/12/92

Order number	Description	Item
V3620516	SMP-I AM 4X 8 D 84	0031
V3620526	SMP-I AM 4X10 D84	0034
V3622236	SMC-I M 4X 8 D 963	0011
V3622448	SMCHI M 6X16 D7991	0061
V3673776	WASHER PA I 4.3 D9021	0033
V3673906	WASHER CRINKLE I M3	0042,0052
V3673916	WASHER CRINKLE I M4	0032
V367 4 736	RIV.C CUNI D3.2 L 3.8	0041,0051
V3675058	WASHER I 6.4 D6798	0062
V6004631	LOCATION BLOCK OUT SRD 01	0060
V603622	SLIDE ADAPTER LEFT 03	0040
V6036221	SLIDE ADAPTER RIGHT 03	0050
V603623	LOC BLOCK BRIDGE 20L\$\$\$01	0010
V603624	SLIDESUPP LEFT 20L 01	0020
V6036241	SLIDESUPPORTRIGHT20L 01	0030

Order number of a complete RACKMOUNT KIT 17": V5631295 00 Date: 01/12/92

Order number	Description	Item
V3620516	SMP-I AM 4X 8 D 84	0031
V3622236	SMC-I M 4X 8 D 963	0011
V3622278	SMC-I M 4X16 D7991	0061
V3673916	WASHER CRINKLE I M4	0032
V3674736	RIV.C CUNI D3.2 L 3.8	0041,0051
V6004632	LOCATION BLOCK 9643 01	L 0060
V603620	LOC BLOCK BRIDGE 17L 00	0010
V603621	SLIDESUPPORTLEFT 17L 00	0020
V6036211	SLIDESUPPORTRIGHT17L 00	0030
V603622	SLIDE ADAPTER LEFT 03	0040
V6036221	SLIDE ADAPTER RIGHT 03	0050

3. INTERCONNECTIONS

3.1 GENERAL INFORMATION

This chapter describes all the interconnections (from one unit to another) that are not integrated on the backboard.

These interconnections are:

- BIT RGB connection between RGB Board and Processor Board,
- EHT connection from EHT board to CRT,
- VG2, VG3-1, VG3-2 from EHT board to CRT Socket,
- Cathode R, Cathode G, Cathode B, RGB ground, G1, filament power and ground from RGB Board to CRT socket,
- connection between Temperature Sensor and Backboard,
- connection between Deflection Board and deflection coils.
- connection between Deflection Board and degauss coils,
- connection between RGB Board and Backboard,
- connection between Control Board and Backboard,
- connection between EHT Board and Backboard,
- AQUADAG from CRT socket to CRT.

IMPORTANT NOTICE

The RGB Board has 8 external connectors, accessible at the rear of the MPRD9600. These connectors are numbered J01, J02, ..., J08 on the rear plate but have another number on the PCB and in the schematic diagrams.

Signal Name	External Connector Number	Number on PCB mask and schematic diagram	
R EXT1 (in)	J01	J1	
R EXT1 (out)	J02	J2	
G EXT1 (in)	J03	J5	
G EXT1 (out)	J04	Ј6	
B EXT1 (in)	J05	Ј8	
B EXT1 (out)	J06	Ј9	
HS/CS	J07	J11	
VS	J08	J12	

The RGB signals from the BIT are connected to 3 (internal) connectors that are not accessible at the rear of the MPRD9600; their numbers are in accordance with the PCB mask and schematic diagrams.

A connector will be referred to by the number on the schematic diagram.

3.2 INTERCONNECTION SPECIFICATIONS

BIT RGB connection between RGB Board and Processor Board

3 coaxial cables connect the BIT RGB signals from the Processor to the RGB Board

Processor Board	Signal Name	RGB Board
J225	RBIT	J4
J224	GBIT	Ј7
J223	BBIT	J10

EHT connection from EHT Board to CRT

The EHT wire leaves the EHT Board and goes to an on-wire EHT connector, the other side of the EHT connector receives the EHT wire coming from the CRT EHT connection.

VG2, VG3-1, VG3-2 from EHT Board to CRT Socket

The VG2 wire (green) leaves the EHT board at solder point VG2 OUT (soldered) and goes to the FOCUS connector. The VG3-1 and VG3-2 leave the focus module and go to the same focus connector.

The plug that fits into the focus connector is drawn on the MPRD9600 CRT Socket (CON FOCUS J2).

Cathode R, Cathode B, RGB ground, G1, filament power and ground from RGB Board to CRT socket

Signal Name	RGB BOARD	Identification on CRT Socket
VG1	J19 pin nr 2	soldered
FILHI	J19 pin nr 1	soldered
GND	J19 pin nr 3	soldered
VRCATHODE	J14	CR
VGCATODE	J15	CG
VBCATHODE	J16	СВ
RGB GROUND	solderlug on case U15	Ј3
	solderlug on case U13	J11

Connection between Temperature Sensor and Backboard

Temperature Sensor	Backboard J9
Ground	J10 pin 2
N.O. Contact	J10 pin 1

Connection between Deflection Board and deflection coils

The deflection coils are connected with J504, two jumpers on the plug that fits J504 open the deflection board power connections if it is plugged out.

Signal name	J504 pin nr	
-150 V (power supply out)	1	grey
+150 V (power supply out)	2	grey
Horizontal deflection coil (high)	3	red
Vertical deflection coil (low)	4	green or black
Vertical deflection coil (high)	5	not used
Vertical deflection coil (high)	6	yellow
+150 V (power supply in)	7	∟ grey
-150 V (power supply in)	8	grey
Horizontal deflection coil (low)	9	blue

Connection between Deflection Board and degauss coils

The degauss coils (2 coils in series) are connected with J501,502; these coils are also used for the vertical white uniformity adjust. Interchanging J501 with J502 will not cause troubles.

Signal name	J501	J502
Degauss coil 1 high	1	
Deguass coil 1 low	2	
Degauss coil 2 high		1
Deguass coil 2 low		2

Connection between RGB Board and Backboard

Two flatcables connect the RGB Board with the Backboard; RGB board connector J3 (26 pins) is connected to J3 on the Backboard and RGB board connector J13 (34 pins) is connected to J13 on the Backboard

Connection between Control Board and Backboard

Control panel Board connector J1 (16 pins) is connected to Backboard connector J7 by a flatcable.

Connection between EHT Board and Backboard

EHT Board connector J2 (20 pins) is connected to Backboard connector J5 by a flatcable.

AQUADAG from CRT socket to CRT

The AQUADAG leaves the CRT socket at plug J4, the other side is connected to the concuctive coating on the bulb.

4. MAINTENANCE KIT

4.1 MAINTENANCE KIT CONTENTS

- OPTISENSE head (V5627412)
- OPTISENSE amplifier (V5627422)
- keypad (V5627431)
- 2 extension boards (left = V5630905, right = V5630906)
- technical manual
- screwdriver (W380027)
- double socket wrench (W3803081)
- trimmer adjust tool (W381006)
- spare captive screws M3 X 8 (V6030961), M3 X 10 (V6030964), M3 X 13 (V6030965)
- spare captive spring (V6030963)
- spare fuse 2 A T (C314116, to be used with 220 V AC / 270 V DCversion only!)
- spare fuse 4 A T (C3141041, to be used with 110 V AC / 170 V DC version only!)
- spare fuse 16 A FF (V314155, to be used with 28 V DC version only!)
- deflection coils extension cable V349639
- degauss coils extension cable V349640 (2x)

Both extension boards can be used for the processor board (plug the RGB cables in the coax receptacles on the extension board) or the optional input module, V5630905 (= left) is to be used when servicing the switch mode power supply, V5630906 (= right) is to be used when servicing the deflection board, during repair deflectioncoils wires and degausscoils wires are to be connected to the deflection board using the extension cables V349639 and V349640.

Double socket wrench key is required to (un-)screw the rackmount screws in bezel.

Screwdriver can be used to (un-)screw MPRD9600 external screws.

Trimmer adjust tool is only to adjust R-trimmers, do not use this tool to adjust the PLL-coil.

Be careful when selecting a spare captive screw, only use screws of correct length.

4.1.1 REQUIRED TEST EQUIPMENT

Maintenance on component level requires following test equipment

oscilloscope

bandwidth > 150 MHz,

- sweep generator

freq. range DC - 300MHz,

- RGB generator

line rate 100KHz, clock rate 150 MHz,

- colour analyser

Thoma TMF3 or better,

- digital multimeter

3 1/2 digit min.

4.2 HOW TO USE KEYPAD

4.2.1 GENERAL INFORMATION ON THE KEYPAD CONTROLS

This text describes the MPRD 9xxx software features. As software required for basic monitor operation/service and software for optional module support were integrated in the same firmware, some of the explained below might not be applicable for your model.

Refer to chapter 9 "OPTIONAL MODULES" to find out which options have been mounted.

USER MODES.

If the monitor is fitted with a softkey control board, the operator can choose between two modes: LOCAL and ALT. If the monitor is fitted with a standard keyboard (or analog controls) only the LOCAL mode will be active.

LOCAL mode.

This mode can be selected for any input source. All keys on the keypad or the control panel will control monitor related functions: contrast, brightness, colour temperature, white uniformity, etc ...

ALT mode.

When selecting the ALT mode, which is only possible when not in BIT, a message on the keypad will appear. Now the only possible selections are: brightness control, contrast control, degauss operation and ALT (= CTRLx on keypad).

All keys on the monitor control panel - the ALT and DEG key excepted - react as softkeys. This means that the keys perform another function. When a key is pressed, its led will start flashing until the monitor has been polled by a host computer, after which the led will be lit constantly. When pressing several softkeys simultaneously, only the last one pressed will be sent and indicated by the led.

The monitor will always start as it was prior to switch-off, bringing back all the selections (EXCEPT FOR THE BATTLE SHORT OVERRIDE) that then were stored in E²PROM.

Each mode has two operation levels: a user level and a test level.

The test level is access protected via a special key sequence, only "qualified personnel" can reach sensitive adjustments. In the test level, some selections and adjustments that only make sense to repair/test personnel can be made. The current mode is shown on the keypad, after start-up or when the keypad is disconnected the software automatically reverts to the user level.

SOFTWARE INPUT SOURCES.

By one or more of the following entry devices, selections can be made:

- **keyboard**. The software detects the presence and the type of the keyboard. So far, 5 different types of keyboard have been defined, i.e. MPRD short digital (standard), MPRD analog, MPRD long landscape, MPRD long portrait and a custom keyboard. If no keyboard is present, the software will select the MPRD short digital as default.
- **keypad**. This little "terminal" can be connected on either side of the monitor on the control bus. The presence of the device is sensed and a start-up screen is displayed to inform the user that the device is ready for input. With the keypad, the monitor can be completely adjusted to the user likings.
- remote interface. Through this way, a serial source such as a host computer can communicate with the monitor to obtain information from it or to readjust it. The communication can be done in 3 standards, being RS232, RS422/423 and an optional mode connecting directly on the board (Optional Module, Backboard Connector J2, pins 51,52,53). The format (8 databits, no parity, 1 stopbit) is always the same, the baudrate can be selected via the keypad.
- inter monitor bus. This is an extension of the remote interface, it is used to communicate between monitors. In this way a monitor sends/receives information to/from another monitor on the daisy chain (RS485).
- optisense. Although this is not an input device for the user, this sensor passes its data via a serial link to the monitor, allowing the software to adjust the colour temperature of the monitor automatically.

GENERAL OPERATION.

All parameters (EXCEPT FOR THE BATTLE SHORT OVERRIDE) inside the monitor are stored in non-volatile memory (E²PROM), so that this data is preserved in time. However, an E²PROM can only be changed a limited number of times (min. 10.000 times) so that after that time, certain parameters will no longer change. When the software detects such an event, a warning message will be displayed on the keypad and be sent via the remote interface. Operation of the monitor is still possible, the warning will disappear automatically, the E²PROMs should be replaced.

When selecting an input source, the SCAN SET linked with the selected input will be copied from E²PROM into RAM. Figure 4.1 shows a part of the E²PROM and the RAM. After power-up, the static parameters are also copied from E²PROM into RAM. Adjusting MPRD9600 parameters is executed in RAM.

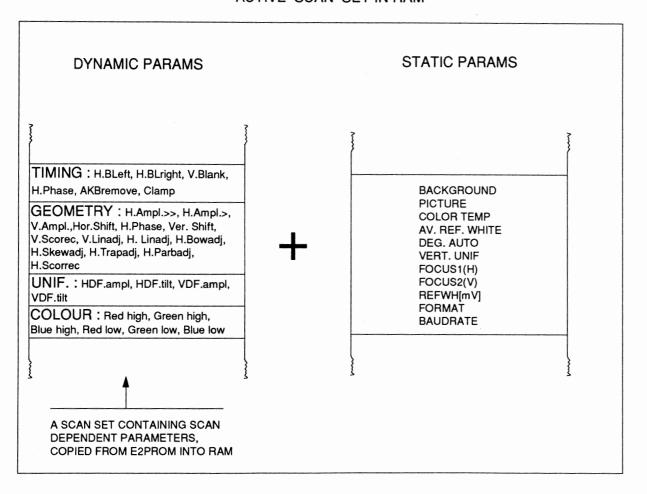
All parameters in the active scan set are compared with those in E²PROM, IFNOT INTEST MODE, the altered RAM parameters will be copied into E²PROM 7 seconds after making the last alteration. (when changing parameters in test mode, they will only be stored when returning to user mode; changes are lost when selecting an other inputsource in test mode because a new scan set is copied into the RAM, overwriting the previous data). The detection of a difference between RAM and E²PROM is displayed by an asterisk in the upper right corner of the keypad display. When the asterisk disappears, the data is preserved and the monitor can be switched off.

When pressing a key on either the keyboard or the keypad, the key will be processed. When a key is pressed for a longer period of time, the increment (decrement) speed will increase.

Not all keys will remain active when selecting a menu on the keypad. When the keypad is disconnected without quitting the menu (= returning to the Main Menu), the menu will be closed by the software and the control panel will be fully enabled again.

2 Data entering modes are available on the keypad: inc/dec or direct entry.
The first mode only uses the + and/or - keys, increasing or decreasing the selected value.
The second mode uses the numeric keys on the keypad followed by the ENTER key. Any overflow will be limited
automatically to the maximum allowed value for the selected parameter.
If in doubt about the maximum range, enter a too large value to have the maximum value displayed; ENTER will validate
this maximum value, pressing QUT or or will restore the previous validated value.

ACTIVE SCAN SET IN RAM



E²PROM SCAN SET FOR BIT TIMING / GEOMETRY / UNIF. / COLOUR SCAN SET FOR INP 1 TIMING / GEOMETRY / UNIF. / COLOUR SCAN SET FOR INP 2 TIMING / GEOMETRY / UNIF. / COLOUR STATIC PARAMS REF. VALUES FOR 5 COLOUR TEMP. LIFETIME COUNTER MONITOR SERIAL N°. **MONITOR TYPE** THOMA & OPTISENSE **PARAMETERS**

All parameters are grouped in menus, which can be selected using the menu keys. In such a menu, a "a" indicates that there are lines higher up, a "a" indicates there are more lines further down. You can scroll up and down the menus with the and keys. To scroll 4 lines at a time (or less if start or end of menu are reached), use the keys. The only way to exit a menu is by pressing the quit key. Quitting a menu brings you back to the main menu, where the general status of the monitor is shown.

Pressing the menu key from within that menu, will reset the screen to the first 4 lines of that specific menu. Exceptions on these general rules are clarified in the Detailed Keypad Menu Overview.

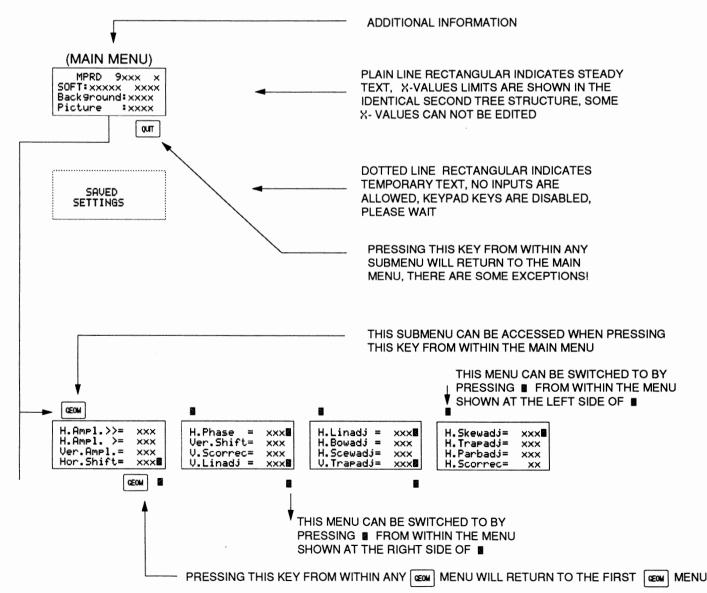
The degauss button has a double function. When pressing it for 5 seconds, the MIS (if installed) will be switched on if it was off, or the other way round. When the MIS is installed and active, the led on the degauss button is lit.

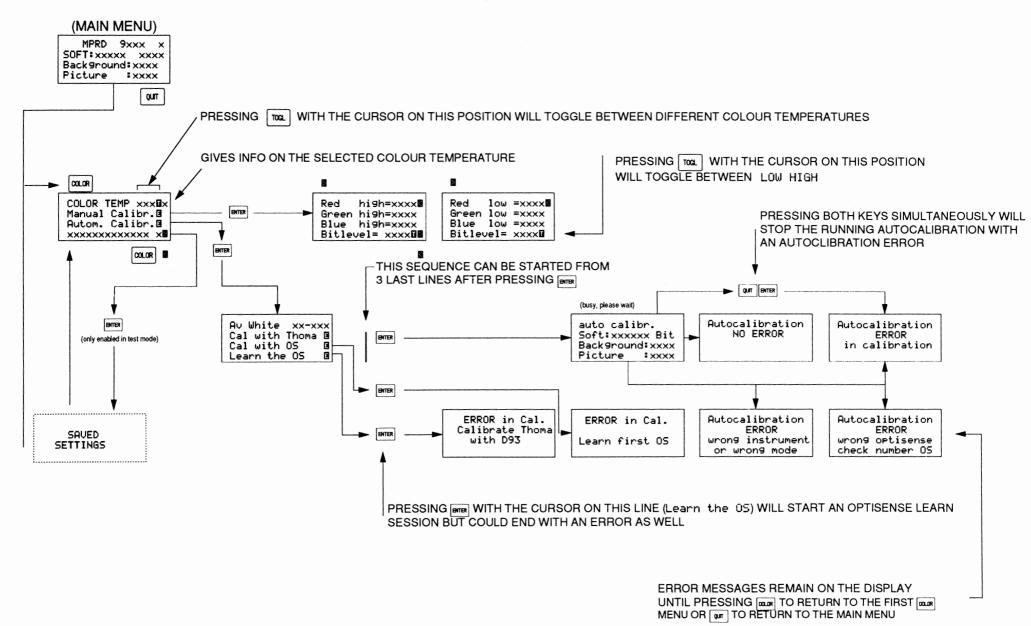
4.2.2. DETAILED KEYPAD MENU OVERVIEW

EXEMPLIFICATION OF THE KEYPAD MENUS

All texts that can appear on the keypad display are shown in a tree-structure; every branch is described in a paragraph. All conditions required to access the branch, the explanation of the parameters, min./max. values etc. will be described.

Tree structure symbolic.





DESCRIPTION OF KEYPAD KEYS AND RELATED FUNCTIONS

DESCRIPTION OF KEYPAD KEY	YS AND RELATED FUNCT	IONS
- (Picture adjust) and	— o + (Background adju	ıst).
Picture (contrast) and background (to the second. The range is 0 to 1023. The board or keypad. On the keypad the There is no need to validate the edit diately processed by the microprosimultaneously, the calibrated value position of the cursor in the main multiple processed by the microprosimultaneously, the calibrated value position of the cursor in the main multiple processed and background adjust and background	orightness) are normally set in the value is increased/decreased. Increment/decrement step is sed parameter with the ENTER occessor. When pressing the for background or picture is a tenu) can also be increased/decrea	a CAL position, being 750 for the first and 523 for d by pressing the corresponding keys on the control. 1, on the control board 5. 1, on th
frequency of approximately 0,2 Hz, picture settings). It is a toggle functi seconds before switching "Battle Or"Battle Override" can be switched on	indicating the "Battle Overron so pressing both keys again verride" on/off again. In case of overtemp (to obtain entire action to ensure picture)	ide" active (and NOT calibrated background and in switches "Battle Override" off/on again (wait 4 picture in a too hot environment) or under normal will not be lost in case of overtemperature.
	WARNING: OVERTEMP	
	BATTLE OVERRIDE	
The keypad main menu shows Bat	tle Mode on the second li	ne if BATTLE OVERRIDE is switched on.
DEG Degauss.		
button to the NDEGAUS line or by	the MIS module (option). B S), so there will be no reaction	degauss key (control panel), by connecting a push setween two degauss operations, a wait time of 5 a. The wait time is necessary for the degauss circuit menu, in the REM menu it is always disabled.
sensors (option) are switched on, the	e contrast and brightness of the setting and the highlights. It	ferred background and picture settings. If the light the picture is the result of the multiplication of the fitted the light sensors are switched off, a fixed voltage
key on the keypad, both background program the PRE1 or PRE2 key, on	and picture are calibrated. It must adjust the contrast and	ing either of these keys. When pressing the CAL This key is only enabled in the MAIN MENU. To I brightness to his liking and then press the SHIFT ain menu and will ask the user in which preset key
When the monitor has a long digita		s, pressing PREI will always switch on the light sensors on-off selection but the values for contrast

_ , _ +
These keys are used to increase or decrease parameters, there is no need to validate the edited parameter with the ENTER key, — and + are immediately processed by the microprocessor.
These keys are used to scroll the cursor through the different lines of a menu.
are used to scroll the cursor 4 lines forward/backward (or less if start or end of menu is reached).
Pressing on the first or on the last line of a menu does nothing, pressing or on a line without
or will position the cursor 1 position up or down.
Pressing on a line with or pressing on a line with will scroll the menu up/down.
None of these keys allow to select a sub menu.
TOGL
This key can only be used if the cursor is on a menu line showing 1 .
Each time TOCL is pressed, another value for the parameter will be displayed, the displayed value is immediately
processed.
(=ALT on control panel, optional)
This selection is only possible when not in BIT!, this key is only enabled in the MAIN MENU and in the database.
CTRLe (INP1), CTRLb INP2 and CTRLe BIT
These keys are present on all control panels and on the keypad as CTRLe for INP1, CTRLb for INP2 and CTRLe for BIT. The selection for INP2 can only be made if a second input board has been installed. The BIT selection will always generate a standard combined pattern with fixed frequency. When changing between inputs, all frequency dependent parameters are recalled from E²PROM to restore the picture as it was set before. If no parameters are available for the input source, parameters are copied from the BIT settings, with the exception for the blanking, which is set to minimum. Frequency dependent parameters are stored in a "SCAN SET" in E²PROM. These keys are only enabled in the MAIN MENU and in the database sub menu.
In this menu, horizontal and vertical blanking parameters can be adjusted. Together with the blanking, the horizontal phase can be set. The AKB removal shifts the AKB line out of the visible area on top of the screen, while the clamp select can be toggled between backporch and synctip for signalS with no or very short horizontal backporch.
H.BLeft : increasing value = larger zone blanked on the left side
H.BRight : increasing value = larger zone blanked on the right side
V.Blank : increasing value = larger zone blanked on top H.Phase : increasing value = active video in picture moves to the right side
H.Phase : increasing value = active video in picture moves to the right side AKBremove : increasing value = AKB-lines move upwards
Clamp : can be toggled between backporch and synctip

GEOM

(see also figure 4.12)

Here all parameters influencing geometry are gathered. The horizontal amplitude is split in a coarse (>>) and a fine (>) adjustment to increase the precision of the alignment. All parameters have a range of 0 to 255, with the exception of the Horizontal S-correction, which only has 0 to 15 range (4 bits).

H.Ampl.>> : increasing value = larger horizontal scan zone (coarse) H.Ampl. > : increasing value = larger horizontal scan zone (fine)

Ver.Ampl. : increasing value = larger vertical scan zone Hor.Shift : increasing value = scanning moves to the right H.Phase : increasing value = active video in picture moves to the right side Ver.Shift : increasing value = scanning moves towards the top V.Scorrec : increasing value = top and bottom zone expand, center is squeezed V.Linadj : increasing value = top expands, bottom is squeezed H.Linadi : increasing value = left side expands, right side is squeezed H.Bowadi : increasing value = upper and lower zone bow to the left H.Scewadi : increasing value = top corners skew right, bottom corners skew left H.Trapadi : increasing value = top corners are stretched, bottom corners are squeezed H.Parbadi : increasing value = top corners bow to each other, bottom corners bow towards each other H.Scorrec : increasing value = left and right zone expand, centre is squeezed (see also figure 4.12)

COLOR

The MPRD 9600 can be aligned for several colour temperatures. In the non-volatile memory there is a section in which the reference values (3 low lights and 3 high lights settings) for each of the five different colour temperatures are stored. These reference values were aligned on the BIT white box pattern and stored using a service password. Another section in the non-volatile memory is used to store the SCAN SETs, one for each input (INP1, INP2 (option) and BIT). Each SCAN SET stores all the parameters defined in the TIM, GEOM, UNIF and GOLOR menu. When selecting an input source, the specific SCAN SET parameters for this input are copied into the ACTIVE SCAN in RAM and are used to align the monitor.

When changing the color temperature by pressing TOGL, the reference values for the displayed colour temperature will be copied into the ACTIVE SCAN. Selecting a reference value is indicated by a character "r" (for reference) on the end of the first line of the COLOR menus. Note that toggling the color temperature will overwrite the previous color setting in the ACTIVE SCAN.

Normally, the use of the reference values will result in correct colour temperatures, although the intensity may not be 100 % correct. Correcting this error is possible by realigning the desired scan set and storing the values in the scan set (E²PROM). This way, other than the standard five color temperatures can be set and stored in the memory.

When pressing ENTER with the cursor on the second line of the menu (=Manual Calibr.) the color settings for the active input source can be (re)calibrated (display shows a color sub menu). Now the low lights and high lights can be readjusted, the new values being saved in the ACTIVE SCAN.

If BIT is the active input, the pattern will change to white box, Bitlevel will be high (100%). The high lights can now be adjusted. When Bitlevel is toggled to low (10%), the low lights can be adjusted.

If INP1 (or INP2 = option) is the active input, the external pattern must be levelled to 100% as RED high, GREEN high and BLUE high are displayed (100%). The high lights can now be adjusted. Pressing — changes the display to RED low, GREEN low and BLUE low (10%), the external pattern must be levelled to 10% and the

low lights can be adjusted. Note that Bitlevel can not be toggled when INP1 (or INP2) is the active input.

When returning to the main COLOR menu (press COLOR) the upper right corner will display "c" (for calibrated).

When pressing QUT (return to Main Menu) within 7 seconds after last changing ACTIVE SCAN parameters, the upper right corner will display "*" indicating a difference between the ACTIVE SCAN (RAM) and the SCAN SET

(E²PROM) for the active input. If no ACTIVE SCAN parameters were changed within the 7 seconds (but they differ from the SCAN SET of the active input) they will be copied into the SCAN SET for the active input.

When selecting a colour temperature (first line of the COLOR menu), a character "ri" (for new) could appear. This indicates that the currently selected colour temperature for the active input is being selected for the very first time (factory programmed default low light and high light values are still present in the SCAN SET for the selected input).

If required, these parameters, manually (re)calibrated for a certain colour temperature and stored in a SCAN SET, can be copied into the reference values. This can only be done in test mode, requiring a service password (see MSC2) menu). In user mode the text "user settings" will be displayed on the last line of the COLOR main menu, in test mode it will be "save changes a". Pressing ENTER with the cursor on this line in test mode will save the colour parameters as reference values.

NOTE:

these new values are now present as potential reference values for all SCAN SETs

BUT THEY'RE NOT AUTOMATICALLY COPIED INTO OTHER SCAN SETS!!!

EXAMPLE:

- INP1 and colour temperature D93 are selected,
- now BIT and colour temperature D93 are selected, colours are calibrated manually and parameters are saved in test mode,
- when selecting INP1 and colour temperature D93, the SCAN SET (E²PROM) for INP1 is copied into ACTIVE SCAN (RAM) BUT the SCAN SET for INP1 still has the old D93 colour references, the COLOR main menu will show a "c" in the upper right corner because the colour termperature differs from the reference values in E²PROM,
- -to copy the new colour references into the INP1 SCAN SET (E²PROM) the cursor must be positioned on the first line of the COLOR main menu, press TOGL until D93 reappears
- pressing TOGL will copy the colour temperature reference values into the ACTIVE SCAN; 7 seconds after having made the last change, these settings will be copied from the ACTIVE SCAN into the INP1 SCAN SET.

Pressing ENTER with the cursor on the third line of the main COLOR menu selects a second COLOR sub menu.

On the first line of this sub menu the Average White level (30-99 Nit) and the current colour temperature are displayed.

The Average White level can be edited in the MISC2 menu but the service password will be required (see below).

The very first auto calibration must be done with a Thoma (was already done in the factory).

Pressing ENTER with the cursor on the second line will start an auto calibration with a Thoma. The monitor switches to BIT (white box) and aligns itself on the color temperature specified in the first line from the sub menu. During auto calibration the display shows another menu, no inputs are required, please wait. When the auto calibration has ended, the monitor remains in BIT, the display shows:

Autocalibration NO ERROR.

During auto calibration, the low and high lights in the active scan are processed and adapted, if ended succesfully, the new calibrated values for the specified colour temperature are stored as reference values and in the SCAN SET for BIT; if autocalibration is stopped, the low and high lights in the active scan could be inaccurate, please re-copy the desired SCAN SET into the ACTIVE SCAN by changing inputsource.

Pressing $\boxed{\text{COLOR}}$ returns to the $\boxed{\text{COLOR}}$ main menu, pressing $\boxed{\text{QUT}}$ returns to the Main Menu.

Note: if the monitor was not in BIT when auto calibration was requested, the INP1 SCAN SET (or INP2) still contains the previous colour temperature settings (refer to manual calibration procedure above).

The first condition for Automatic calibration with an OS is that, at least once, the monitor has been calibrated for D93 with a Thoma, the second condition is that "Learn the Q5" was executed at least once before, USING THE CURRENT OPTISENSE HEAD AND AMPLIFIER!!!

For best results, the "LEARN OPTISENSE" should be executed only on a monitor that was recently calibrated. "Learn the Optisense" measures and stores the Optisense characteristics, as well as its serial number. If another Optisense® (having another serial number than the one used for the learn sequence) is connected it will be detected, indicating that a new Optisense learn sequence is required.

Apart from these conditions, the autocalibration sequence for Thoma or OS correspond completely.

Autocalibration is always executed on BIT (monitor switches to BIT), manual calibration can be also executed on INP1 (or INP2 = option).

Auto calibration can be stopped by pressing QUT and ENTER simultaneously, the keypad will display an error message. Other error messages will be displayed if, as yet, D93 was not calibrated yet with Thoma, if the OS learn sequence hadn't been executed, if calibration with OS was requested but Thoma was connected (or vice versa) or if an OS was detected with a different serial number than the one read during the last OS learn sequence.

CAUTION: During calibration it is advisable to cover the front of the monitor with a dark coloured cloth to prevent ambient light interfering with the CRT light output.

MISCI

A variety of functions are grouped in this menu.

Parameters that can only be edited if already in BIT before selecting MISCI are: Format, Pattern and Color(s).

Pressing TOGL with the cursor on the first line of the MISCI menu to switch between either the 5/4 or 4/3 aspect ratio for BIT.

Pressing TOGL with the cursor on the second line of the MISCI menu selects the current BIT pattern.

- STDBIT. A combined test pattern that includes monochrome and colour bars together with a convergence grid.

- CROSSHATCH To check the convergence of the picture and the geometry.
- BOX

To align the colour temperature of the monitor with a colour analyser or an optisense.

- FIELD To check the screen for purity, missing dots and other screen related problems.

In case of the last three patterns one or more colours can be switched off. This is not possible for the STDBIT because the design is deliberately made that way. Other patterns than the first are meant for service purposes only, and are therefore selected via the keypad menus. Note that when BIT is again selected by pressing BIT on the control panel or CTRLo on the keypad the bitpattern will change to STDBIT, as a precaution the STDBIT is always shown at 100%

in order to guarantee a picture whenever BIT is selected, no matter what picture or colours were on, even if the bitlevel indicates "low".

In test mode two more patterns can be selected: SYNCWH and OPTBIT; these are for future development. If one of these is selected and mode is reverted to user mode, the bit pattern selection will not be affected.

Pressing TOGL with the cursor on the third line of the MISCI menu allows to switch on/off the BIT RGB-signals. Note that when BIT will be selected again - by pressing BIT on the control panel or CTRLo on the keypad - the three BIT RGB-signals will be switched on.

On the fourth line REFWH(mV) can be adjusted.

The default value is 700 mV (monitor was factory calibrated for this value). This means that RGB input signals of 700 mV (+ 300 mV sync) will give a calibrated picture (colour and lightoutput). If the signals connected to INP1 (or INP2 = option) have a different maximum value, they will not generate a calibrated picture.

Setting REFWH(mV) to the max. input level of the RGB input signals and auto calibrating the monitor again will result in calibrated pictures for the applied RGB signals. Note that adjusting REFWH(mV) directly affects the light output for the BIT-patterns CROSSH, BOX and field.

rife second menu (press) groups the HLC (option), PTS (option) and URBT (TNG functions.
ALC can be switched on/off by pressing TOGL with the cursor on the second line of this menu. Note that ALC is
always switched on when pressing PRE1 and switched off when pressing PRE2. ALC can also be switched on by
pressing ALC on the control panel.
MIS can be switched on/off by pressing TOCL with the cursor on the third line if the MIS (option) is installed
(hardware) and enabled in the MISC2 menu.
Orbiting will slightly shift the picture both horizontally and vertically in order to reduce screen burn, especially for
low picture contents with high peak brightness. It can be enabled/disabled by pressing touch with the cursor on the fourth line.
The third menu (press) groups data on the applied scanning.
The horizontal/vertical frequency is measured and calculated, the horizontal/vertical sync polarity are measured; all data is displayed.
When pressing in this menu, all parameters will be refreshed.
If the processor is unable to show correct values for Hor. freq, one of the following texts will appear:
- LOCK? : PLL out of lock, - VS? : no vertical sync present,
- HFLB? : no (faulty) hor. flyback signal,
- VRNG? : vert. freq. out of range,
- I2C? : no (faulty) communication with deflection board.
If the processor is unable to show correct values for Vert. freq, one of the following text will appear: - VRNG? : vert. freq. out of range.
blank zone : no specific info available
With this information one can discriminate different generator timings, each of them can be fine-tuned in another scan set and recalled automatically by the software as it recognizes the timing. A "data base" of different scan sets coordinates this process.
MISC2
This menu contains "sensitive" adjustments and factory settings, all of them protected by a service password. In this menu the software mode (test/user) is selected, the OPTISENSE is aligned, the lifetime is shown,
The first line shows the number of hours that the monitor has been operational.
When first entering this menu, the second line will show "Password no" which means that the service password must be entered if one or more of the settings in this menu have to be changed; the last line will show "User ==> Test" which means that current software mode is user mode.
The default service password is set to ENTER before shipment
Pressing ENTER with the cursor on the second line will show another menu.
Program Furth with the current on the first line of this manner will with the current of
Pressing ENTER with the cursor on the first line of this new menu will switch to another menu asking to enter the current service password. The SHIFT-function on the keypad is automatically activated; the password must only be made
service password. The SHIFT-function on the keypad is automatically activated; the password must only be made

After pressing ENTER, the password will be checked; if it was correct, a text "Password correct" is displayed,
after one second the MSC2 main menu will reappear. The second line now shows "Fassword Acc". If the
password wasn't correct, "Password False" is displayed, pressing QUT returns to the Main Menu, pressing
MISC2 returns to the MISC2 main menu.
If the service password was entered successfully, all functions (but one) will be enabled in this menu.
$Pressing \ \boxed{\text{ENTER}} \ with the cursor on the second line of this menu allows to alter the user password. Note that if the current$
$password\ was\ not\ entered\ yet, pressing\ \boxed{\texttt{ENTER}}\ will\ return\ to\ the\ \boxed{\texttt{MISC2}}\ main\ menu.\ If\ the\ current\ password\ was\ entered$
before, a new menu will appear allowing to enter the new service password. The password must only have letters (A-
Z) and/or numbers (0-9) and/or space ($=$ CTRLd) with a total of maximum 6 characters. The last displayed character
can be deleted by pressing SHIFT . After pressing ENTER, the new password will overwrite the old one, the
display shows the Misc2 main menu.
Note that disconnecting the keypad resets to "Password no".
Pressing ENTER with the cursor on the third line (Settings) will show another menu.
The first line allows to install or remove the database by pressing the TOGL key. Data is not lost after switch-off/
switch-on sequence.
The second line is used to inform the software if a MIS module (option) is installed, press the to make a
selection (this does not switch on/off the MIS module).
The third and fourth line allow to enter a colour temperature for USR1 and USR2. Note that an autocalibration in the
menu for the altered colour temperature must be executed to obtain calibrated colour temperature !!!
Pressing shows the last part of the settings menu.
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Pressing ENTER with the cursor on the "Life time" line switches to the life time sub menu allowing to alter the
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Pressing ENTER with the cursor on the "Life time" line switches to the life time sub menu allowing to alter the current lifetime. When replacing the processor board, the life time must be copied into the E²PROM of the new board. Pressing ENTER with the cursor on the "Type number" line allows to enter the monitor's type number, this number is displayed on the first line of the main menu. Pressing ENTER with the cursor on the "Serial number" line allows to enter the monitor's type number, this number must be in accordance with the number on the identification plate of the monitor. Pressing ENTER with the cursor on the "AU Ref White" line allows to edit the lightoutput. Note that an autocalibration in the COLOR menu for the all colour temperature must be executed to obtain calibrated lighoutput for all colour temperatures!!! If the last character of the "AU Ref White" line equals a it indicates that the factory password has been entered instead of the service password. An additional menu can now be seen by pressing —.
Pressing ENTER with the cursor on the "Life time" line switches to the life time sub menu allowing to alter the current lifetime. When replacing the processor board, the life time must be copied into the E²PROM of the new board. Pressing ENTER with the cursor on the "Type number" line allows to enter the monitor's type number, this number is displayed on the first line of the main menu. Pressing ENTER with the cursor on the "Serial number" line allows to enter the monitor's type number, this number must be in accordance with the number on the identification plate of the monitor. Pressing ENTER with the cursor on the "AV Ref White" line allows to edit the lightoutput. Note that an autocalibration in the color menu for the all colour temperature must be executed to obtain calibrated lighoutput for all colour temperatures!!! If the last character of the "AV Ref White" line equals a it indicates that the factory password has been entered instead of the service password. An additional menu can now be seen by pressing —. The fourth line in the MSC2 main menu will end with a if the password was entered correctly. This allows to toggle
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UNIF

Two UNIF main menus are shown. The first one gives access to all parameters, the second one is shown if the MIS option is installed (in the MISC2 menu), it has a limited set of parameters.

The first parameters (accessible by pressing 1, only if MIS is not installed) allow to adjust the vertical uniformity, and the "Deg. auto" function.

When edited, vertical uniformity is stored in the SCAN SET of the active input as it is a scan dependent value. IF the "Deg. auto" displays 0, automatic degauss is disabled; all entered values less than 10 are converted to 0, the working range is 10 - 999. The value shows the time interval between two Degauss cycles in seconds.

The second menu groups all focus parameters.

Focus 1(H) allows to align the static focus for horizontal lines, Focus 2(V) allows to align the static focus for vertical lines. Note that these two alignments might influence each other. Both alignments are static and frequency independent, so they will not change when selecting another scan set.

Apart from the static hor, and vert, focus, there is also dynamic focus. Both amplitude and tilt of the hor, and vert, dyn, focus can be edited at the end of the second menu. Dynamic focus amplitude and dynamic focus tilt are adjusted for a single scanning, the values are stored in the SCAN SET of the active input, they may have to be altered if another scanning is applied to the same input source.

REM

This key selects the remote menu. The MPRD is capable of communicating with a host computer via a serial link. The type of the link is set by hardware jumpers on the microprocessor board, the baudrate is software selected. Apart from this serial link, a serial inter monitor bus provided, enabling the user to put several monitors in a daisy chain, reducing the number and length of the interconnections. Via software, the first monitor on the IMB is given the MASTER status, the others are given the SLAVE status (2 - 9). Any communication between the host computer and a SLAVE monitor is passed on through the MASTER. Via the keypad, all monitors can be controlled from the master in broadcast mode, addressing all monitors on the chain simultaneously, or in slave mode, addressing one specific monitor as if the keypad were plugged into that monitor. The selecting and programming of all related parameters are done in this REMOTE menu. If a keypad is connected on a SLAVE during a BROADCAST session, it will display the addressed menus and the new data values.

The IMB will only function properly if one and only one monitor was assigned the Master status and if all slaves were assigned a different number.

As all monitors leave the factory with MASTER status all but one must be switched to slave before starting a remote session on the IMB.

A remote session can only be opened on the keypad connected to the MASTER, for this reason, the first line of the main menu is used to display whether the monitor is the master or a slave.

Pressing ENTER with the cursor on the second line of the REM main menu displays a sub menu allowing to select between master or slave. Only the master/slave setting of the monitor to which the keypad is connected can be changed.

Pressing ENTER with the cursor on the third line of the REM main menu will open a session (this selection is blanked if the monitor to which the keypad is connected is a SLAVE). A new menu appears: pressing the 0 will enter the broadcast mode, all monitors on the chain, including the master, will react to subsequent key presses, the MASTER does not listen to any slave, there is **no feedback**. Another value (2-9) will pass the key presses to the SLAVE monitor with the corresponding number, the data that normally appears on the keypad of the SLAVE monitor is also sent back via the bus and displayed on the MASTER keypad. The slave answers to the commands of the MASTER via the IMB, with the MASTER checking the data received. Any of these sessions can be terminated by pressing the very returning keypad control to the MASTER monitor only (without returning to the Main Menu).

Only a reduced number of commands can be executed in Slave control or Broadcast mode.

Pressing 0 starts the Broadcast mode, a new menu appears, with all monitors on the IMB then receiving the same data/commands.

NOTE: The dat	a displayed on the MASTER keypad is only valid for the Master monitor.					
e.g.	Pressing the $\begin{bmatrix} - \\ 0 \end{bmatrix}$ will decrease the contrast for all monitors connected on the IMB.					
	This is done by sending the command "decrease background" to all monitors on the IMB; if not					
	all monitors had the same contrast setting when the session was opened, they won't have it either					
	after pressing $\begin{bmatrix} - \\ 0 \end{bmatrix}$ or any other increase/decrease command.					
	If all monitors need to have the same background settings, the setting on the MASTER must be					
	executed using direct entry; put the cursor on back ground, enter the correct value using the numeric keys followed by ENTER.					
	Now this value (and not an increase/decrease commando) is sent to all monitors and they will have identical brightness settings.					
Pressing COLOR f	from within the BROADCAST main menu shows a sub menu allowing to change the colour					
temperature. Pres	sing a changes the selected colour temperature but again it does not guarantee that all monitors did					
select the same co	plour temperature.					
Pressing QUT fr	om within this menu returns to the BROADCAST MODE menu, this is an exception to the general					
rule that pressing	OUT would return to the Main Menu.					
Pressing MISC2 fr	om within the BROADCAST main menu shows a sub menu with the lifetime. Pressing QUT from					
within this menu	returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing					
QUIT would retu	irn to the Main Menu.					
Pressing UNIF fr	om within the BROADCAST main menu shows a sub menu allowing to edit the "Deg. auto"					
parameter. Pressi	ng QUT from within this menu returns to the BROADCAST MODE menu, this is an exception					
to the general rule	e that pressing QUT would return to the Main Menu.					
Pressing MISCI from within the BROADCAST main menu shows a sub menu allowing to toggle the "ALC", "MIS"						
and "ORBITING" settings. Once again, note that it does not guarantee that all monitors do have the same settings						
for "ALC", "MIS" and "ORBITING". Pressing $\boxed{\text{QUT}}$ from within this menu returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing $\boxed{\text{QUT}}$ would return to the Main Menu.						
	n (pressing ENTER) with the cursor on the third line of the REM main menu) and entering a value starts a SLAVE CONTROL session for the SLAVE monitor assigned to that number.					
Pressing COLOR fr	om within the SLAVE CONTROL main menu shows a sub menu allowing to change the colour					
temperature. Pres	sing a changes the selected colour temperature.					
Pressing QUT fr	rom within this menu returns to the SLAVE CONTROL main menu, this is an exception to the					
general rule that p	oressing QUIT would return to the Main Menu.					
Pressing MISC2 from within the SLAVE CONTROL main menu shows a sub menu, the lifetime of the SLAVE						
monitor is displayed. Pressing QUT from within this menu returns to the SLAVE CONTROL main menu, this is						
an exception to th	e general rule that pressing QUT would return to the Main Menu.					
Pressing UNIF fro	om within the SLAVE CONTROL main menu shows a sub menu allowing to edit the "Deg. auto"					
parameter, the displayed value is the setting of the SLAVE monitor. Pressing $\boxed{ t QUT}$ from within this menu returns						
to the SLAVE CC	ONTROL main menu, this is an exception to the general rule that pressing out would return to					
the Main Menu.						

Pressing MISCI from within the SLAVE CONTROL main menu shows a sub menu allowing to toggle the "ALC", "MIS" and "ORBITING" settings, the displayed settings are those of the SLAVE monitor. Note that in this case pressing the TOGL will unambiguously display the correct SLAVE monitor settings for "ALC", "MIS" and "ORBITING". Pressing QUT from within this menu returns to the SLAVE CONTROL main menu, this is an exception to the general rule that pressing QUT would return to the Main Menu.

Pressing ENTER with the cursor on the fourth of the REM main menu displays a sub menu that allows to toggle between the different Baudrates. Only the Baudrate of the monitor to which the keypad is connected can be changed. This is the Baudrate for the Remote (RS232 or RS422) and the IMB; default is 9600 Baud, other Baudrates are 1200, 2400 and 4800.

CTRLd

DO NOT TRY TO OPERATE THE DATABASE BEFORE GROWING ACCUSTOMED TO THE BASIC KEYPAD OPERATIONS

The CTRLd key selects the database.

The database allows to save and recall scan sets.

If a scanning is applied, the horizontal & vertical frequency and sync. polarity will be measured each second. If the scan frequency and sync polarity have not changed, the same scan set is used. If at least one of these has changed, the new input frequency and sync polarity will be looked up in the database, starting with scan set 00. If these values are found in one of the scan sets stored in the database, the monitor will automatically use all the settings that are defined in that particular scan set, it becomes the default setting for the selected input. If they cannot be found, the database will create a new scan set, it becomes the default settings for the selected input.

46 Different scan sets can be stored in the database, if all scan sets are used and an unknown scanning is applied, the database will overwrite scan set 45. Not that the above mentioned functions are disabled upon entering the database menu.

Scan set 00 is reserved for BIT but INP1 and/or INP2 (optional) can also use this scan set.

Database Organisation

3 Pointers BIT, INP1 and INP2 are used to link an input source with a scan set. By default the BIT pointer is linked with scan set 00, INP1 to scan set 1, INP2 to scan set 2 (these are the 3 scan sets described earlier). The hor. & vert. frequency and sync. polarity of a scanning are used to automatically select a scan set in the database (see fig. 4.2).

- e.g. Pointers are on their default position, the scanning on INP1 is changed, the frequency does not match with scan set 01.
 - The INP1 pointer is reset (it points to scan set 00) and checks if the frequency and sync. data of this scan set is in accordance with the applied scanning. If so, the pointer remains on this position, if not the pointer is set one scan set further, the same checks are then repeated. This sequence continues until a scan set with corresponding freq. and sync. data is found. If such a scan set cannot be found, a new one will be created.
 - This new scan set is a copy of 00 (for BIT) but the freq. and sync. data is replaced by the current measured data; note that if all 46 scan sets were already used, scan set 45 will be overwritten!

Pressing in the circle main menu (2 scan sets displayed) shows the hor. & vert. frequency and sync. polarity for the 2 scan sets. The last character on the first and third line are a copy of those in the CIRL main menu. Pressing returns to the CIRL main menu.

In either of these two menus MISCI, REM, QUIT, TOGL and ENTER can be used to execute several functions.

Pressing CTRLd from within the CTRLd main menu will measure and show the freq. and sync. for the selected input source, the selected scan set is of no import. Pressing CTRLd again will refresh the data; pressing QUT returns to the CTRLd main menu.

Pressing REM from within the CTRLd main menu allows to copy or remove a scan set.

Before entering this menu the scan set that has to be copied or removed must be selected by scrolling the cursor.

Pressing ENTER with the cursor on the third line (Copy scan set) shows a new display. The first line shows the number of the selected scan set and the number of the new scan set to which the data will be copied. The number of the new scan set is filled in automatically, it is the first free scan set found when searching from 00. When pressing ENTER with the cursor on the third line (Copy free) all parameters for the new scan set are copied from the selected scan set. When pressing ENTER with the cursor on the fourth line (Copy free) the frequency and sync. polarity of the selected input will first be measured and then stored in the new scan set. The other parameters for the new scan set are copied from the selected scan set.

After pressing ENTER, a time bar on the second line will indicate the copy progress, please wait until the CTRLa main menu is shown to press any key.

delete: A deleted scan set cannot be restored automatically, THINK TWICE!

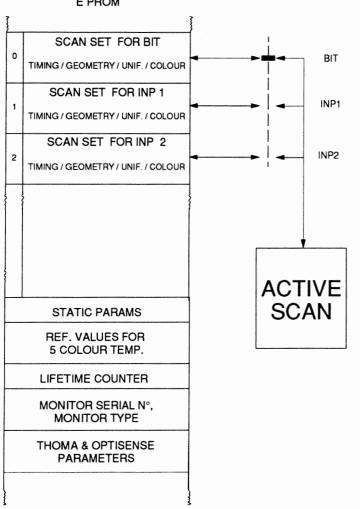
Pressing ENTER with the cursor on the fourth line (Del scan set) shows a new display. The second line shows the number of the selected scan set that will be deleted. Pressing ENTER with the cursor on the third line (NO) will return to the CTRL4 main menu without deleting the selected scan set; pressing ENTER with the cursor on the fourth line (YES) will switch to a new menu displaying a time bar, please wait until the CTRL4 main menu is shown to press any key.

NOTE: - if scan set 00 is selected, the cursor cannot be placed on the Del scan set line,

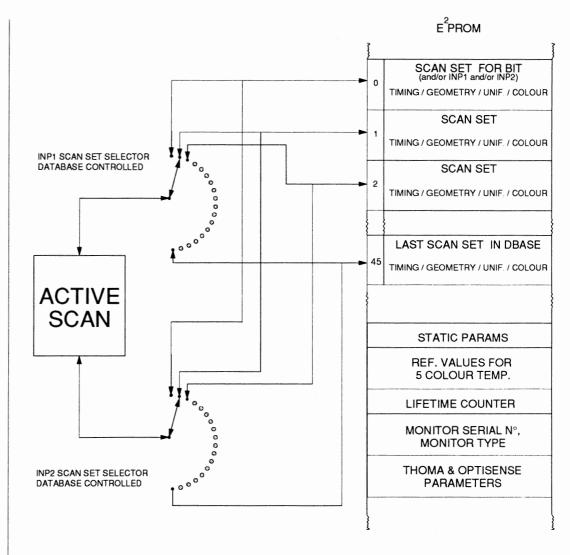
- if the scan set assigned to the current selected input is deleted, BIT will become the active input,
- if a new scan set was assigned to the selected input and then deleted, the scan set that was assigned to the same input before entering the database will be reassigned again automatically.
- remaining scan sets will not be renumbered upon deleting an intermediate scan set

DBASE NOT INSTALLED

e²PROM



DBASE INSTALLED



Pressing QUT from within the CTRLd main menu will check if an input has been assigned to a new default scan set. If so, a new menu will appear asking if the new default is to be saved. Press 1 to save the old scan set as default, press 3 to save the new scan set as default

If no new default was assigned, the Main Menu will appear on the keypad.

Note that only the LAST input assigned to a new default scan set can be stored.

Pressing TOGL from within the CTRLd main menu allows to jump to a specified scan set. If ENTER is pressed with the cursor on the second line the CTRLd main menu with the INP1 default scan set will be displayed. If ENTER is pressed with the cursor on the third line the CTRLd main menu with the INP2 default scan set will be displayed. On the last line the number of a scan set can be entered. When ENTER is pressed with the cursor on the fourth line after entering the desired scan set umber, the CTRLd main menu with that scan set will be displayed.

If a number of a non existing scan set is entered, the data base will jump to the scan set with the number closest to the desired one.

Pressing ENTER from within the CTRLd main menu allows to edit all parameters of the selected scan set, the parameters of the selected scan set are copied in the active scan (not frequency and sync.), now the active input is shown on the screen with the parameters of the selected scan set (first display shows Loading value, then a new menu appears). If parameters are edited, the new values will be stored in E²PROM (on the address of the selected scan set) and in RAM (= active scan set). When pressing QUT in this menu, the parameters in the active scan will be restored with initial values that existed prior to entering the Edit menu.

In the Edit menu the scan set label can be edited by pressing ENTER with the cursor on the first line. Letters (keyboard shift is activated automatically), numbers and space can be entered with a maximum of 8 characters. The last displayed character can be erased by pressing SHIFT —.

All selections, (apart from Edit label, described above and a disabled Autom. Calibr. in the color menu) that can be made in the Edit menu, are identical copies of previous described menus. They are now activated by pressing ENTER. They were explained earlier when discussing the TIM, GEOM, COLOR and UNIF menus selected from within the Main menu.

4.2.3 WARNING AND ERROR MESSAGES

During monitor operation, the text on the keypad can be overwritten by a warning or an error.

If a warning or error is displayed, only the picture, contrast, PRE1, PRE2, CAL, DEG, CTRLx, CTRLa, CTRLb and CTRLc keys are enabled.

The warning or error can be removed by pressing on the keypad, the Main Menu will then be displayed.

The software starts searching for warnings and ends with the errors; all of them are scanned in a fixed sequence, only the first one encountered is displayed.

After connecting a keypad a warning or error may be displayed, which had been saved by the processor board. Only the first one will be displayed, e.g. if EHT goes down, the AKB on the RGB board will also fail. As the EHT board went down first, only the EHT error will be displayed.

Extra info on Warnings and Errors.

Warning Overview

OVERTEMP:

indicates over temperature inside the monitor, EHT goes down

REPLACE E2PROM:

faulty write cycles, data can no longer be saved in the device

MEMORY:

static RAM corrupted, will not be copied to E2PROM

Error Overview

PROCESSOR BOARD:

an error occurred on the processor board, auto reboot after 15 seconds,

REBOOT SYSTEM

keypad is temporarily disabled

HARD- & SOFTWARE: DEFLECTION

communication between processor board and controller on deflection board

stopped

VERTICAL DEFLECTION:

vertical deflection malfunction

HORIZONTAL DEFLECTION:

horizontal deflection malfunction

EHT:

EHT malfunction

RGB:

RGB malfunction

WARNING/ERROR	PRIORITY		
WARNING: OVERTEMP	1		
ERROR: PROCESSOR BOARD REBOOT SYSTEM	2		
ERROR: HARD- & SOTFWARE DEFLECTION	3		
ERROR: UERTICAL DEFLECTION	4		
ERROR: HORIZONTAL DEFLECTION	5		
ERROR: EHT	6		
ERROR: RGB	7		
WARNING: REPLACE E2PROM	8		
WARNING:	9		

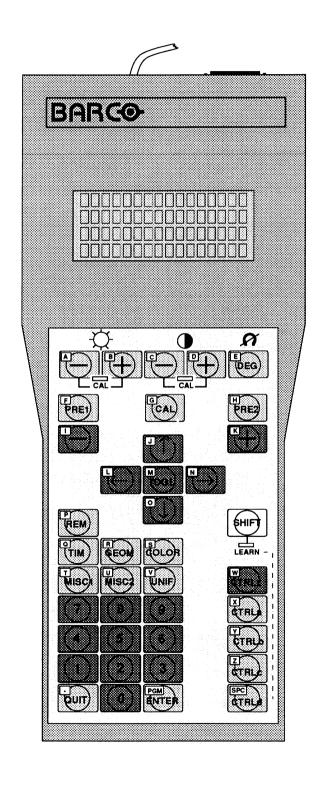
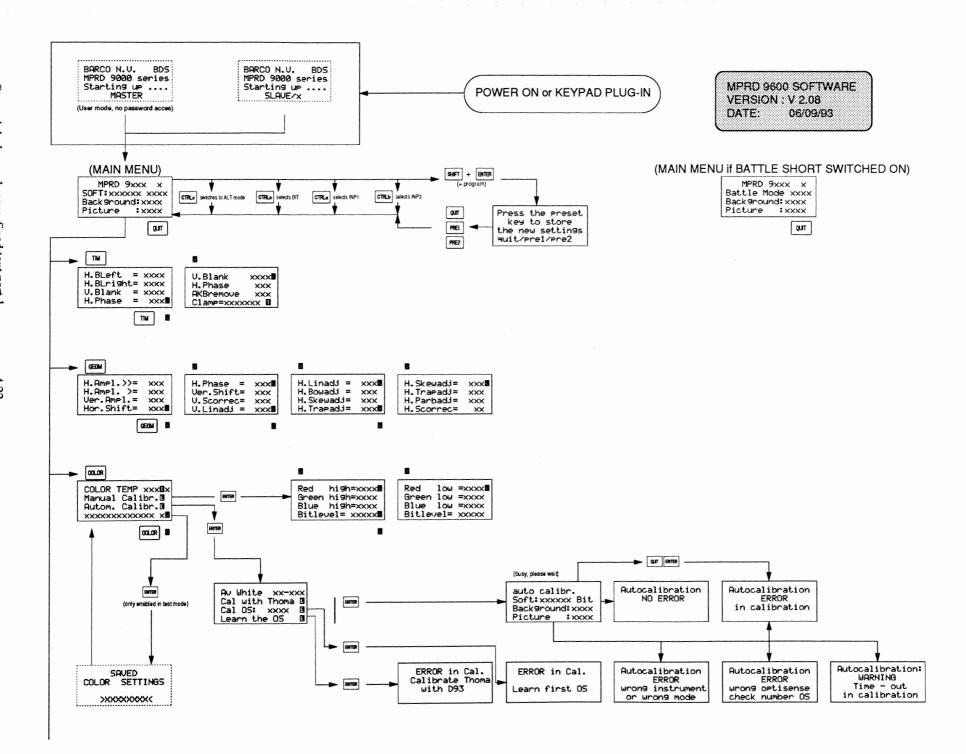
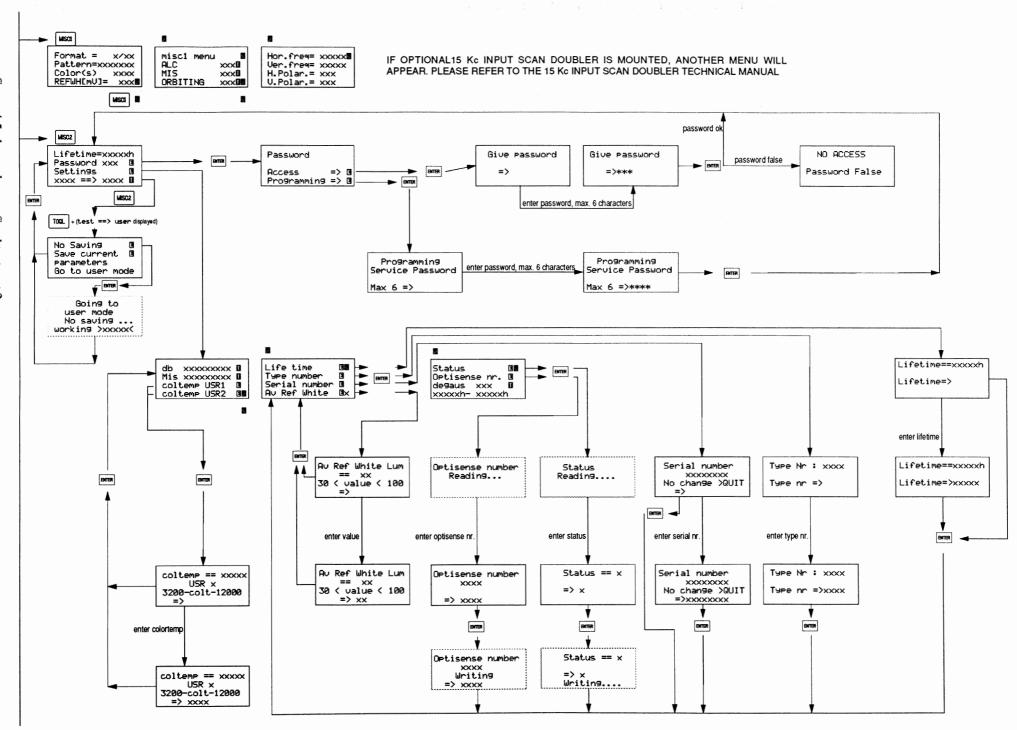
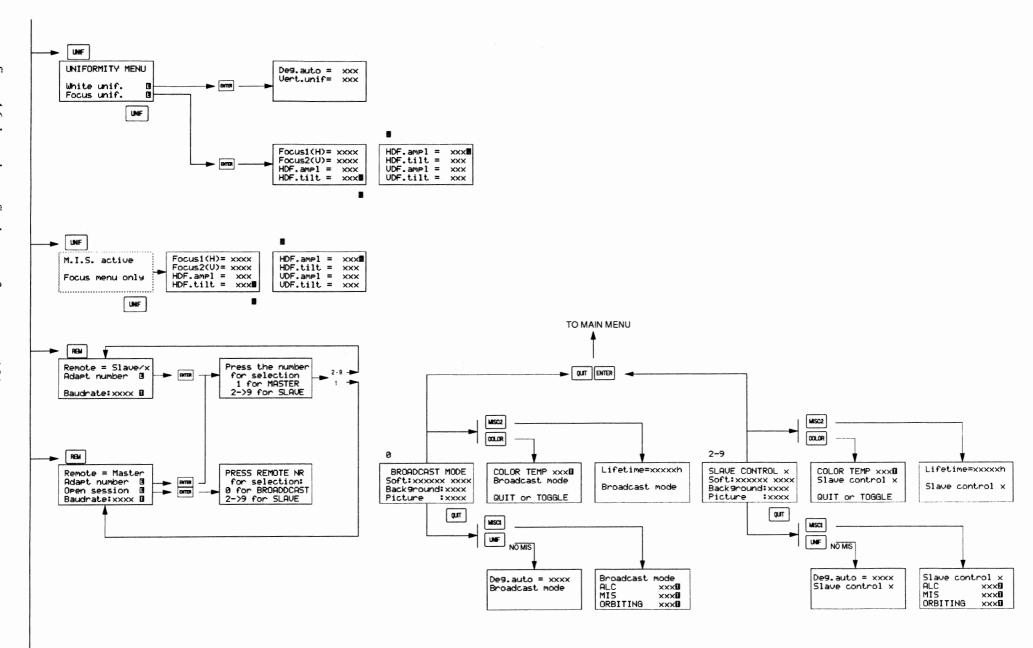


figure 4.3: keypad







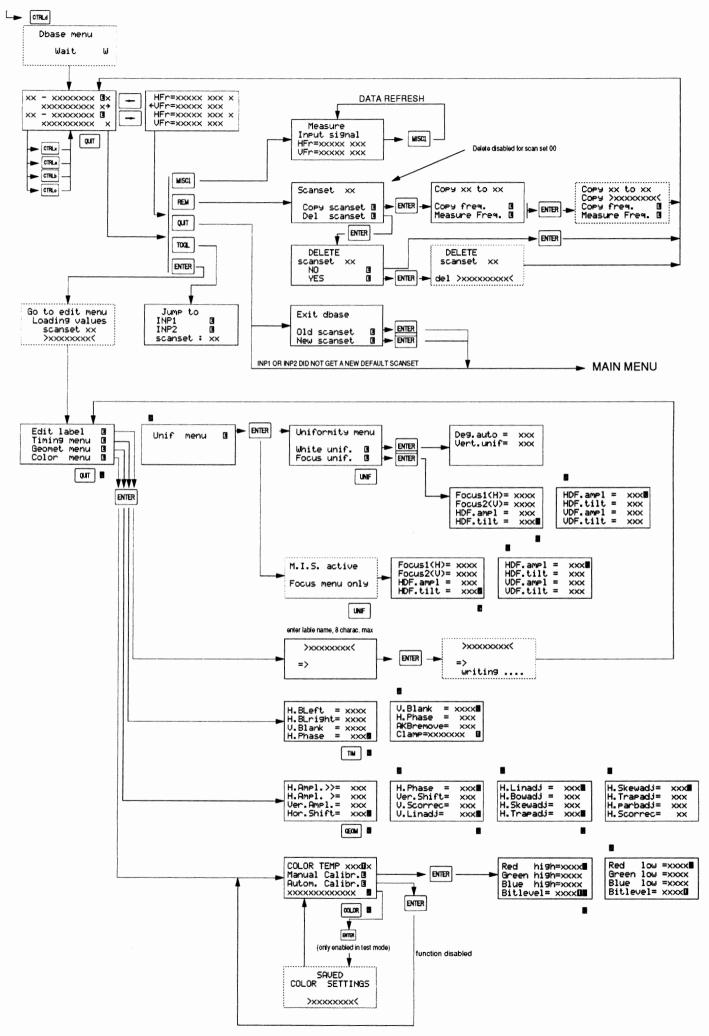
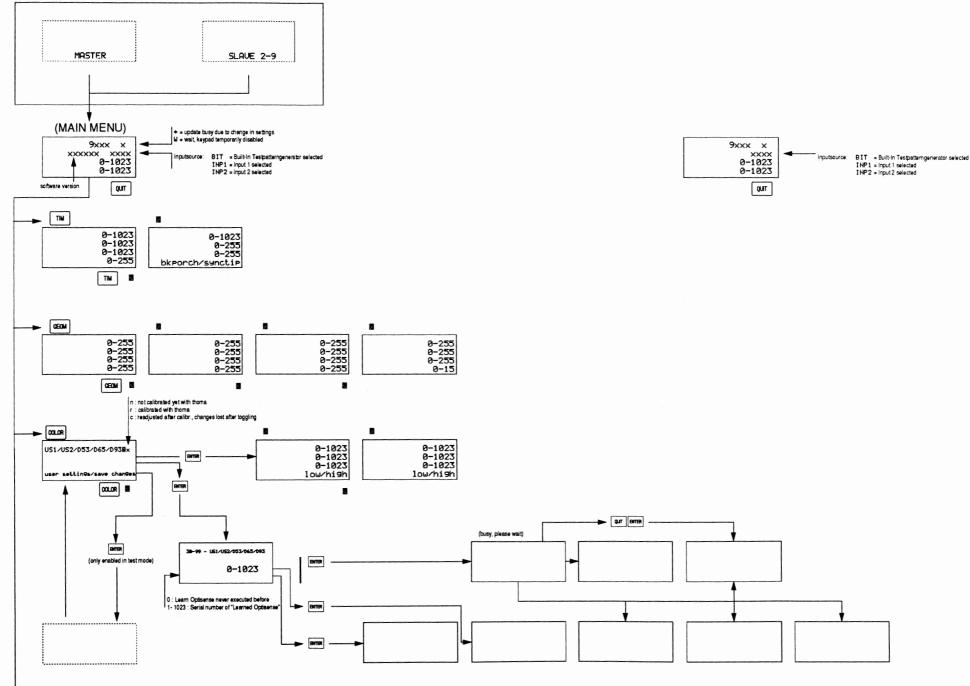
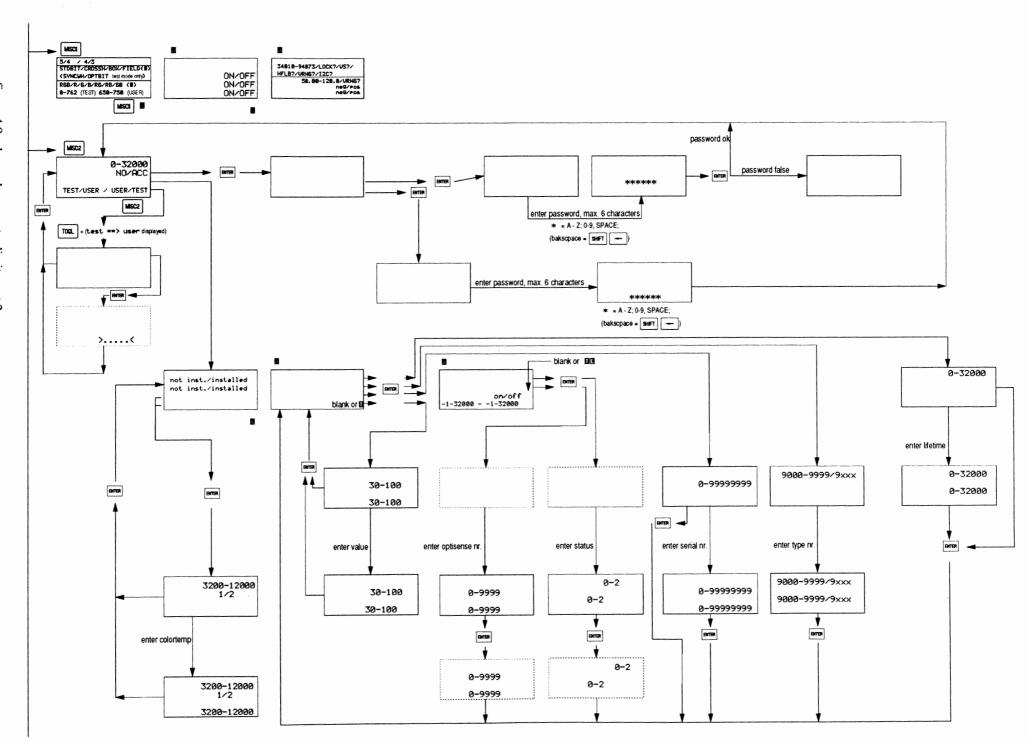
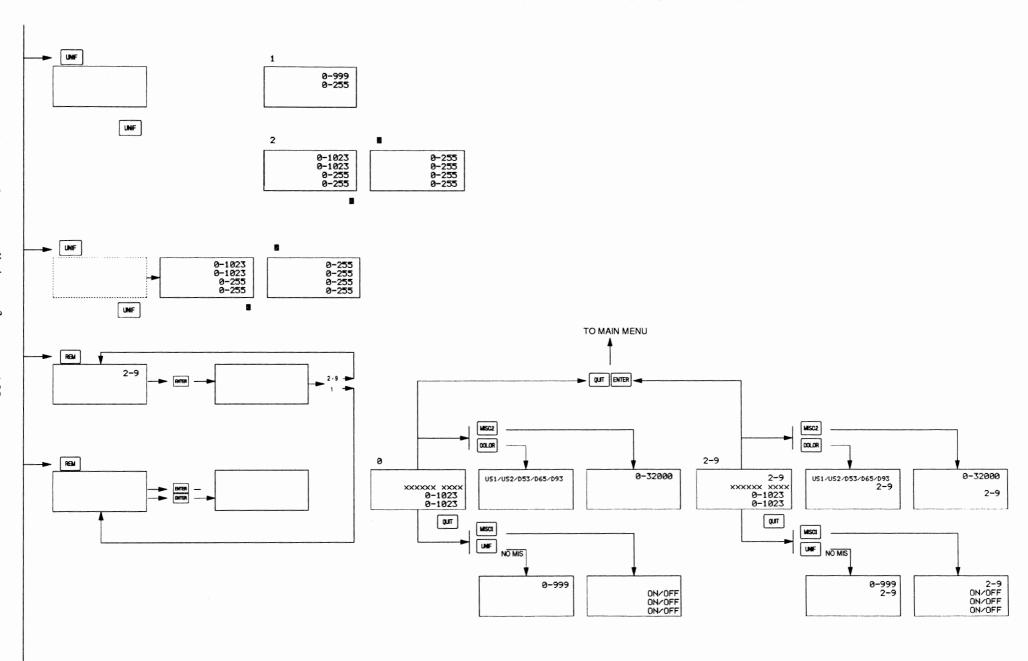


figure 4.7: keypad menu fixed text part 4









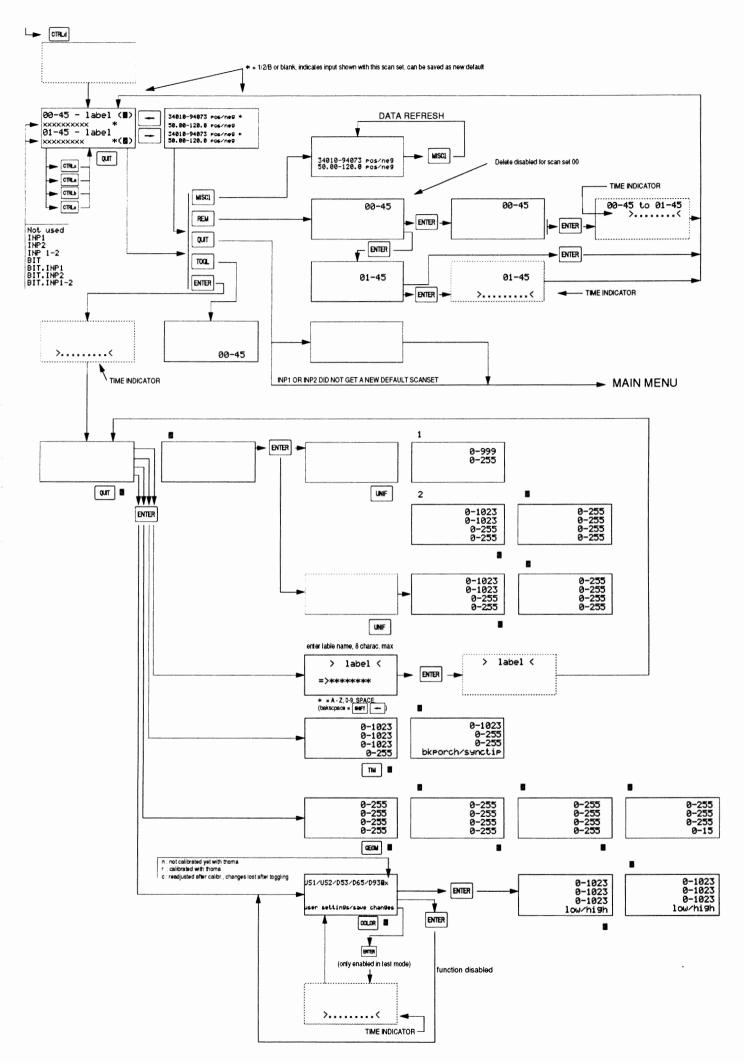
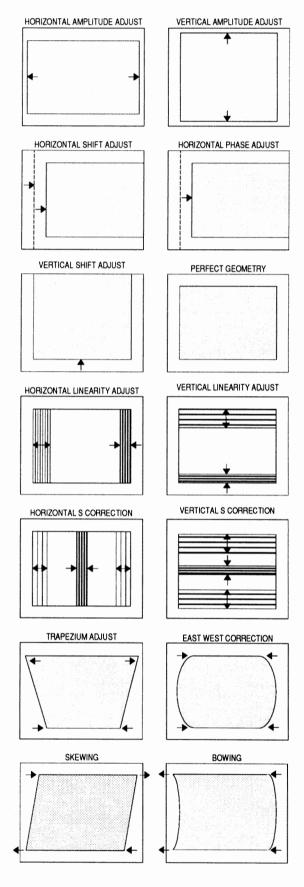


figure 4.11: keypad parameter limits part 4



arrows indicate screencorrections for incrementing values on keypad

figure 4.12: geometry

4.3 HOW TO USE THE OPTISENSE®

The Optisense is a maintenance tool specially designed for use with 9000 series monitors. Each Optisense has its own serial number, which is checked for by the software during an alignment. With the optisense, it is possible to reproduce a previously set condition of the monitor, which needs to be done if the picture tube or the RGB boards are swapped from a monitor. The Optisense is part of the "color loop", translating light output to electrical values. Therefore, the Optisense has been aligned with a monitor to determine the translation factors. It is possible to use the same Optisense for a number of monitors, but later the monitor must be re-aligned with the same Optisense used in the "Learn Optisense" sequence. Once the "Learn Optisense" was executed, the Optisense serial number will appear in the third line of the second | color | submenu (Automat. Calib.); 0 indicates "not executed yet". The serial number is marked on top of the Optisense Head and on the bottom of the Optisense Head Amplifier. If a different Optisense is used, the software will show an error on the keypad display.

Calibration of the monitor is done in three steps.

At first, the monitor needs to be aligned with an exact measuring color analyser such as the THOMA TMF 3. In that way, the color temperature of 9300 K is adjusted on the monitor and stored in the E²PROM from the monitor (Cal with Thoma). If an Optisense is connected during this phase, an error will be shown on the display.

The second calibration run is with an Optisense connected to the monitor (Learn the OS). In this second run, the serial number of the Optisense and its scale factors are stored in E²PROM.

> FOR BEST RESULTS, THE "LEARN OPTISENSE" SEQUENCE SHOULD ONLY BE EXECUTED ON A RECENTLY CALIBRATED MONITOR.

The third and every run thereafter (Cal with OS) is recalibrating the monitor at a desired color temperature with an Optisense or a Thoma.

If in doubt about the use of the Optisense, contact the factory for additional information, prior to any experiments.

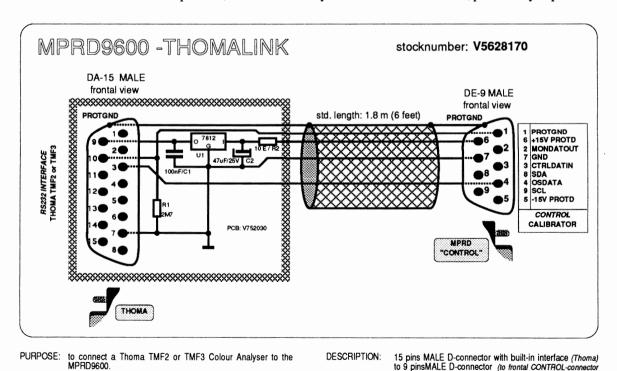


figure 4.13: Thoma connection cable

15 pins MALE D-connector with built-in interface (Thoma) to 9 pinsMALE D-connector (to frontal CONTROL-connector or CONTROL-connector at the rear of the MPRD9600, or the 9 pins D-connector on the Keypad connected to the MPRD9600).

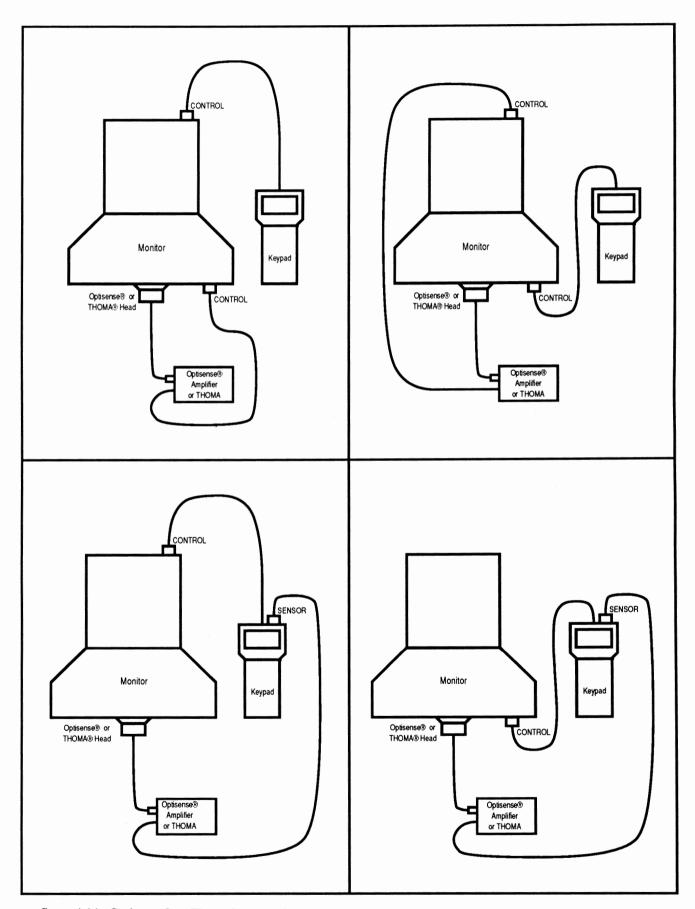


figure 4.14: Optisense® or Thoma® connections

NORMAL FLOW FOR COLOUR CALIBRATION WITH AN OPTISENSE OR A THOMA



D93 IS ALIGNED WITH THOMA

(ANOTHER COLOUR TEMPERATURE COULD ALSO BE ALIGNED)

FIRST "LEARN OPTISENSE" IF COLOUR TEMPERATURE WILL BE CALIBRATED USING AN OPTISENSE HEAD AND AMPLIFIER

	USER MODE	TEST MODE	
AUTO CALIB.	RESULT OF CALIBRATIC VALUES , ACTIVE SCAN	ON IS STORED IN REF. AND SCAN SET FOR BIT	
MAN CALIB.	RESULT OF CALIBRATION IS STORED IN ACTIVE SCAN SET, 7 SECONDS LATER IT IS STORED IN THE SCAN SET OF THE ACTIVE INPUT, MANUALLY CALIBRATED PARAMETERS CAN NOT BE STORED AS REFERENCE VALUES, TOGGLING THE COLORTEMPERATURE FOR THE SELECTED INPUT WILL DELETE COLOUR SETTING OF MANUAL CALIBRATION	RESULT OF CALIBRATION IS STORED IN ACTIVE SCAN SET, 7 SECONDS LATER IT IS STORED IN THE SCAN SET OF THE ACTIVE INPUT, MANUALLY CALIBRATED PARAMETERS CAN BE STORED AS REFERENCE VALUES USING "SAVE SETTINGS"	

figure 4.15: Normal flow for colour calibration with an Optisense or a Thoma

Operation:

The Optisense is used with the keypad, it is connected to the control bus of the monitor. You can use both control bus connectors from the monitor or you can loop the Optisense on the keypad extension connector on top of the keypad. Either way, the software will detect its presence.

If a Thoma color analyser is used, the connection should be made at the control bus as well, and not on the Remote IN!!! To connect a Thoma to the MPRD9600, only use a cable as shown in figure 4.13.

The Thoma is powered via the keypad, switch on the Thoma by pressing the ON key, press the ADJ key twice. Cover the light sensor (sensor must be dark!) and press the X,Y,Z button. The LCD screen on the color analyser shows the values for X,Y and Z; all values should display zero.

Now, place the Thoma lightsensor or the Optisense Head on the CRT and cover the bezel/screen with a dark coloured cloth. Select the color menu on the keypad and proceed with the Autom. Calibr. An alternative is to press the key on the keyboard, which is selected by pressing the + and the - key simultaneously. As soon as this selection is made, the monitor will switch to BIT input and select the white box pattern. Make sure the Optisense or the color analyser head are well aligned with the box pattern on screen.

4.4 KEYPAD CIRCUIT DIAGRAM

The optional keypad can be connected at the front control panel or at the rear of the display via the 9 pins SUBD connector. Connection with the board is obtained via the 10 pin Mini Mate plug (J2). The 9 pin SUBD (J1) connector on the rear of the keypad is used to connect the OPTISENSE box for automatic plug adjustment. The keypad is driven by the protected (with D1...D4) serial I2C bus (SCL, SDA). This feeds the whole display and is available at pin 8 of the LIGHT SENSOR connector on the keypad and the CONTROL connector on the Control panel. The supply voltage +/-15 V is supplied by connector J1. The +15 V is used to obtain the necessary +5 V via a voltage regulator 7805 U1. A 'soft start up' is also provided with R17 and C1 when plugging in the keypad.

Keyboard:

Characters and functions can be inserted via the keyboard. The keyboard has 42 buttons (S11-S67) of which 40 are used. The 7 columns and 6 rows form the keyboard matrix which is scanned by the μP via U4 (P0...P6) and U5 (P0...P5).

Display:

The LCD display receives data via U2 P0...P7 and is driven via the control lines E (P5; Select), RS (P6: Control/Data) and R/W (P7: Read/Write) via U3. The LCD intensity is software controlled with a D/A convertor built around U6, R1...R11. The LCD back lighting is performed by the inverter A1. It is switched off via J4. The resistor R13 protects the inverter if the connector to the LCD display J4 is disconnected. R12 and BR1 compensate aging of the back lighting after about 100 Hours. BR1 starts in 'L' position, after backlight aging the 'H' position can be selected. LEDS:

Learn/Shift Led (D7): This Led is driven via U4 P7 and will light up when:

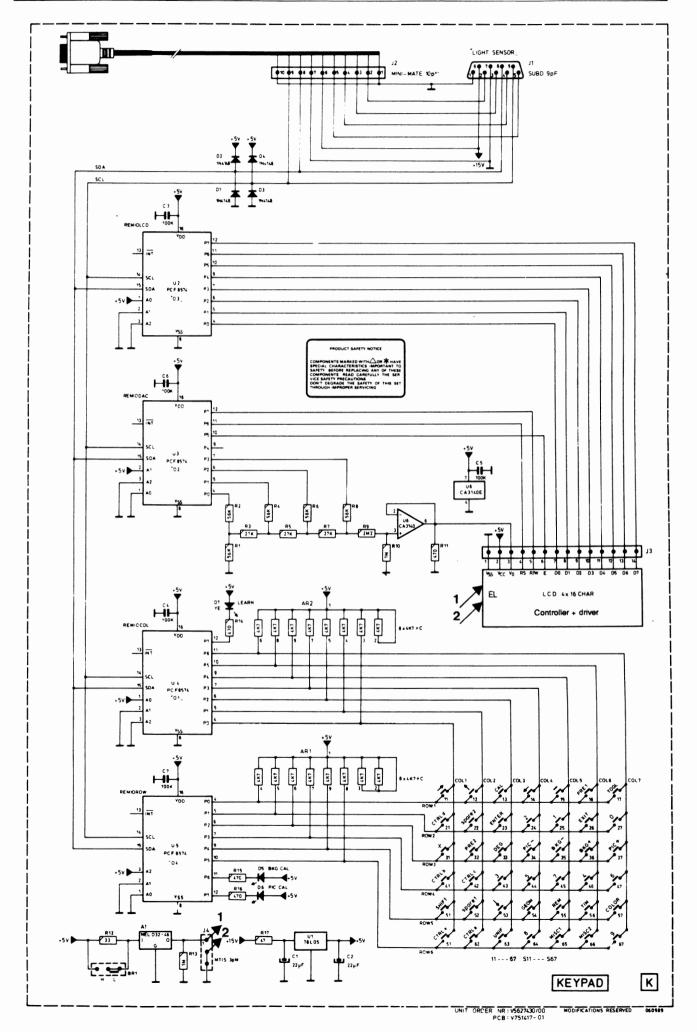
The MPRD is set in the Learn Mode during the programming of the CTRL keys.

- The keyboard is set in Shift Mode which allows two functions per key.

BKG cal Led (D5) and PICT cal Led (D6) which are driven via U5 (P6..7) light up when the Picture and Background adjustment is set in the calibrated position.

4.4.1 SCHEMATIC DIAGRAM

	12	u.		21.14.1516.3417.5 ARZ ARL 6	,	. ,	10		14	
c		3 6.47		t		2			5	
MISC	6R1	U2U3U4 U5	14	02 01 04 03 07 05 06	U١		J2	U 6	U6 /1	LCD 511 · 567



5. DIAGNOSE

5.1 HARDWARE & FAULT FINDING TREE



ALWAYS DISCONNECT MONITOR FROM MAINS OR POWER SUPPLY BEFORE REMOVING COVER

ALWAYS DISCONNECT MONITOR FROM MAINS OR POWER SUPPLY BEFORE REPLACING BOARDS

Four boards (RGB, Deflection, EHT and Processor) have a fault led; if one of these leds lights, the front panel indicator FAULT will light too (wired or function).

As a malfunction on one board can influence the behaviour of other boards, following procedure must be used to find the faulty board:

check if POWER indicator lights:

- replace power fuse if blown

- replace Power Supply board (P), power up again and check for picture

on screen (problem could be solved)

check if OVERTEMP indicator lights:

- monitor should function again if internal temperature goes below 70 °C

- try to ensure better cooling

power up, select bit and check if testpattern appears on the screen; if it does there is something wrong with the video source or the connections between the video source and the monitor (problem is situated outside the monitor)

fault indicator on Processor board lights: - check if switching monitor off and on again solves the problem

- power down and replace Processor board (C), power up again and check

for picture on screen (problem could be solved)

picture on screen (problem could be solved)

(1)

(3)

fault indicator on Deflection board lights: - power down and replace Deflection board (D), power up again and check for picture on screen (problem could be solved)

fault indicator on EHT board lights:

fault indicator on RGB board:

- power down and replace EHT board (E), power up again and check for

- power down and replace RGB board (A), power up again and check for

picture on screen (problem could be solved)

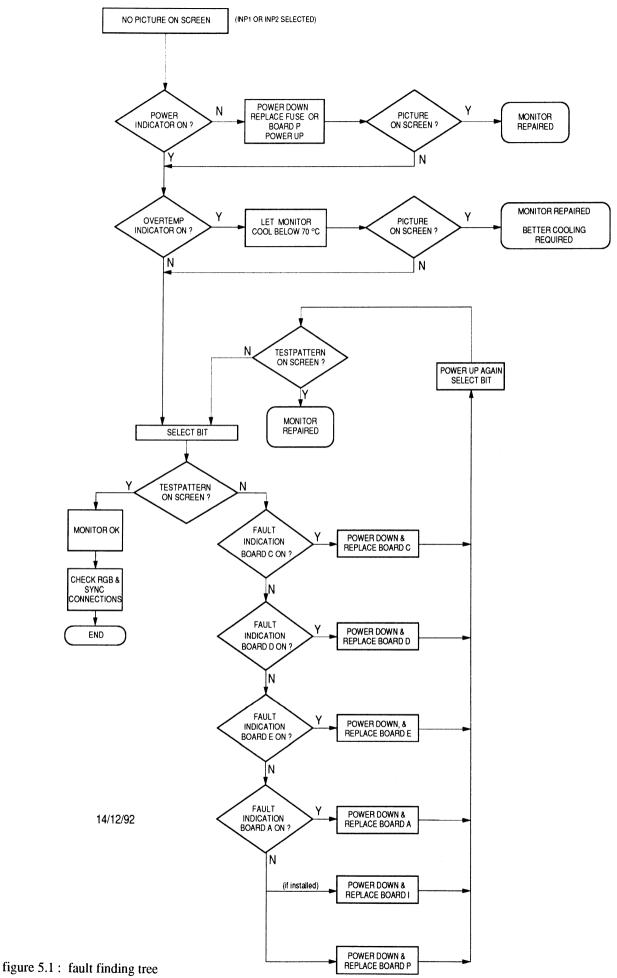
If replacing boards C, D, E and/or A did not solve the problem, replace Power Supply board (P) even if Power indication front panel lights, start again from "fault indicator on Processor board lights".

Power Supply board hicking will probably be caused by faulty Deflection board or a power circuit overload.

⁽¹⁾ can be caused by Power Supply board malfunction or on-board failure

⁽²⁾ can be caused by Power Supply board, Processor board malfunction, Deflection board malfunction, overtemperature or on-board failure

⁽³⁾ can be caused by Power Supply board, Processor board malfunction, Deflection board malfunction, EHT board malfunction, overtemperature or on-board failure



5.2 SOFTWARE

For software diagnose, a keypad has to be connected to the monitor. In part 4.2.3 of this manual all warning and error messages are described in detail.

6. ADJUSTMENTS

REQUIRED TEST EQUIPMENT

- oscilloscope

bandwidth > 150 MHz.

- RGB generator

line rate 100 KHz, clock rate 150 MHz,

- colour analyser

Thoma TMF3 or better,

- digital multimeter

3 1/2 digit min.

6.1 DEFLECTION BOARD

The only component that can be adjusted is L502. This coil is factory adjusted and only has to be readjusted after replacing C61, D509, R50, R59 or U12.

L502 also has to be readjusted if the PLL is unable to lock over the complete frequency range (exceptional).

Procedure:

- Switch off the display.
- Select BIT.
- Connect the + lead of a digital voltmeter to TP515, connect the common to TP529
- For a 32 64KHz deflection board, adjust L502 for a meter reading of 7,5V.
- For a 40 80KHz deflection board, adjust L502 for a meter reading of 3,9V.
- For a 47 94KHz deflection board, adjust L502 for a meter reading of 3,9V.
- If available, connect the lowest and highest specified scan to monitor and check if it locks.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

6.2 EHT BOARD

Be sure of a good earth connection to prevent electrical shocks

DO NOT TOUCH THE SEALED POTENTIOMETER, IT IS FACTORY SET AND NEEDS NO ADJUSTMENT

Vg2 adjustment

After 10 minutes warm-up, measure the voltages (against electrical ground, 0V) with a DC-voltmeter on TP1, TP2 and TP3 of the AKB-module (see section 2, figure 2.4).

Connect the DC-voltmeter to the testpoint with the highest voltage and adjust P2 (on the EHT board) for 110 Vdc reading on the DC-voltmeter.

6.3 PROCESSOR BOARD

See chapter 2, figure 2.35 for PCB component side layout.

RESET

Board inserted in monitor (on extender board)

- Put P200 in its mid position.

+10VREF

Measure with DMM on TP 211 and adjust with P201 for (10.000 ± 0.002) V.

DAC GAIN

Make sure the "HBLSTOP (HBL LEFT)" parameter is set to the value 1000 using the Keypad ("TIM" menu). Measure with DMM on TP 216 and adjust with P204 for (10.000 ± 0.002) V.

AMBLS AMP

Board inserted in monitor (equiped with ALC control panel version only)

Put the Processor board on an extender board so that P202 (near the "Remote" subD connectors) is accessible during normal operation of the monitor. Don't forget to reconnect the three coax cables for the BIT generator.

- Make sure the front face of the monitor is illuminated with 4000 lux.
- Measure with DMM on TP 213 and adjust with P202 for (10.000 ± 0.050) V.

The adjustment of "AMBLSENS AMP" makes possible that the light output of the monitor with ALC off is equal to the light output of that same monitor with ALC on and illuminated with 4000 lux in case the PICTURE (Contrast) and BACKGROUND (Brightness) controls are calibrated in both cases.

BIT GENERATOR GAIN

Measurement conditions:

Put the Processor board on an extender card so that P203 and P205 (near the 10-bit DAC, U221) are accessible during normal operation of the monitor. Don't forget to reconnect the three coax cables for the BIT generator as they terminate the three BIT output drivers.

- Select "BIT" as an (internal) input source (instead of INP1 or (INP2)] with the Keypad.
- Select the BIT Generator control menu on the Keypad (MISC1).
- Select "BOX" signal.
- Set "REFWH" parameter in the control menu to 700 mV.
- Measure with oscilloscope (100 mV/DIV, DC-coupling, 2µs/DIV) on TP209.

Adjustment:

* Adjust with P203 for a black-to-white box signal level of (1400 ± 10) mVpp.

6.4 POWER SUPPLY BOARD

Mains Voltage Adjustment.

To set the AC mains voltage, disconnect the display from the mains, remove the top cover (34 screws), unscrew the two screws fixing the switch mode power supply (left top and center bottom).

Locate the jumper (selecting the mains voltage) on the switch mode power supply PCB (see figure 2.39).

Replace the fuse in the fuseholder, 2 A SLOW for 220V AC, 4A SLOW for 115V AC. Fuses are supplied with the MPRD 9600 Monitor and Maintenance Kit.

Adjustment of the power supply output voltages.

All voltages are adjusted simultaneously with one trimmer.

110/220 V AC VERSION

- Switch off the display.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Switch on the display.
- Connect a DVM between testpoint TP8 (GND) and TP6 (+6.3V). Adjust P1 for a meter reading of 6.0 VDC.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

28 V DC VERSION

- Switch off the display.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Switch on the display.
- Remove top cover and locate the power supply board.
- Connect a DVM between testpoint TP208 (GND) and TP206 (+6.3V). Adjust P200 for a meter reading of 6.0 VDC.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

Replacing a blown fuse.

110/220 V AC VERSION

Fuseholder is mounted on heatsink of power supply module. Switch off display before replacing fuse.

USE A 2A SLOW FUSE ONLY FOR 220 V AC USE A 4A SLOW FUSE ONLY FOR 110 V AC

28 V DC VERSION

Fuseholder is mounted on board P.

- Switch off the display before replacing fuse.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Replace fuse.
- Reinstall cover, tighten 34 screws.

USE A 16A FAST FUSE ONLY!!!

7. OPTICAL FILTER REPLACEMENT

When replacing the filter, it is advisable to replace the seal filter frame as well.

Remove the upper filter latch and unscrew the screws holding the lower filter latch and remove the filter. If filter was smashed, also remove lower filter latch and carefully remove all the remaining filter parts.

Position the lower filter latch, reinsert the screws but don't tighten.

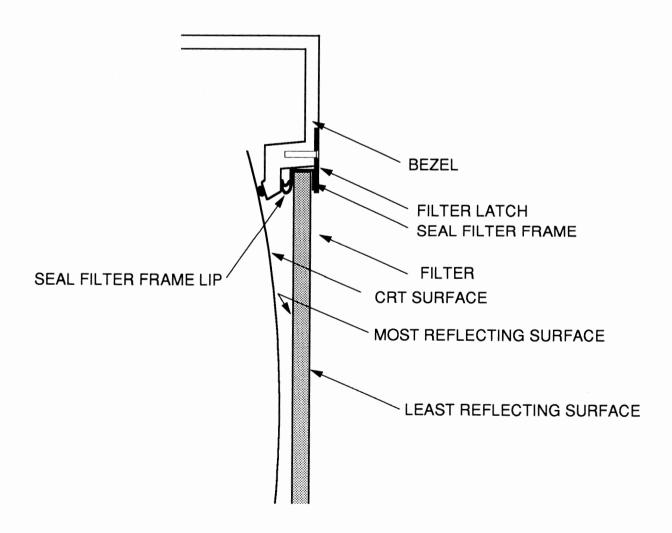
Clean the CRT and inner filtersurface with a soft cloth and isopropyl alcohol.

Carefully position the seal filter frame over the filter edges. Avoid touching the filter surface.

Make sure that the lip of the seal filter frame is placed at the most reflecting surface of the filter.

Hold the filter vertically with the most reflective surface to the CRT; position the underside of the filter beyond the lower filter latch. Sustain the filter while mounting the upper filter latch, tighten the screws crosswise.

	OPTICAL FILTER	SEAL FILTER FRAME	FILTER LATCH
17"	V603598	V6035954	V603690
20"	V6005273	V6035953	V603691



8. LIST OF ABBREVIATIONS

SINGULAR

A	Analog
ACK	ACKnowledge
AD	multiplexed Address & Data
ADD	ADDress
ADJ	ADJust (voltage)
AKB	Automatic Kinescope Biasing
AMB	AMBient
AMP	AMPlifier
AMPL	AMPLitude
AN	ANode
AUX	AUXiliary
AX	AXial
B	Blue
BKG	BacKGround
BL	BLanking
BOW	BOWing
BO W	Bownig
C	
	Current orComposite
CA	CAthode
CHAS	CHASsis
CL	CLamp orCoiL
CLK	CLocK
COL	COLumn
CON	CONnector
CONV	CONVergence
CORR	CORRection
CTRL	ConTRoL
D	Digital
DEFL	DEFLection
DEG	DEGauss
DF	Dynamic Focus
DLYD	DElaYeD
DEMUX	DEMUltipleXer
DET	DETector
DIAGN	DIAGNose
DIS	DISable
DLY	DeLaY
DRVR	DRiVeR
DTA	DaTA
DYN	DYNamic
EHT	Extra High Voltage
EN	ENable
EXT	EXTernal
F	Focus orFrequency
FDB	FeeDBack
FEEDB	FEEDBack
FIL	FILament
FIFF	DIFFerential
FLYB	FLYBack
FP	
FP G	FrontPorch
GEN	Green
UEN	GENeral

(update 06/04/93)

8.1

```
...GND...
                       ...GrouND...
...H...
                      ...Horizontal...
                      ...HIgh...
...HI...
...HW...
                      ...HardWare...
...IC...
                      ...Integrated Circuit...
...ICON...
                      ...InterCONnect(ion)
...IN...
                       ...INput...
...INH...
                      ...INHibit...
...INIT...
                      ...INITial(isation)...
...INT...
                      ...INTernal...
                      ...Light...
...L...
...LIN...
                      ...LINearity...
...LO...
                      ...LOw...
                      ...LeVeL...
...LVL...
...M...
                      ...Mixed... or ...Measure(ment)...
...MAN...
                      ...MANual...
...MAX...
                      ...MAXimum...
...MIN...
                      ...MINimum...
...MOD...
                      ...MODulator...
...MUX...
                      ...MUltipleXer...
...N...
                      ...Not-... (inverted or active low)
...NEG...
                      ...NEGative...
                      ...OPTional...
...OPT...
                      ...OUTput...
...OUT...
...P...
                      ...Pulse...(0-5 V)
...P15...
                      ...Pulse...(0-15 V)
...PARAB...
                      ...PARABola
...PATT...
                      ...PATTern...
...PIC...
                      ...PICture...
...POL...
                      ...POLarity...
...POS...
                      ...POSitive...
...PRES...
                      ...PRESent...
...PRIM...
                      ...PRIMary...
...PROT...
                      ...PROTection...
...PROTD...
                      ...PROTecteD...
...PWM...
                      ...Pulse Width Modulator...
                      ...Red...
...R...
...RCVR or RX...
                      ...ReCeiVeR
...RDY...
                      ...ReaDY...
...REF...
                      ...REFerence...
...REM...
                      ...REMote...
                      ...REQuest...
...REQ...
...RET...
                      ...RETurn...
...RETR...
                      ...RETRace...
...RX...
                      ...Receive(r)...
                      ...Sync...
...S...
...SCORR
                      ...SCORRection...
...SEC...
                      ...SECundary...
...SEL...
                      ...SELect...
...SENS...
                      ...SENSor...
...SEP...
                      ...SEParated...
...SFTY...
                      ...SaFeTY...
...ST....
                      ...SyncTip
...STRT...
                      ...STaRT...
...SW...
                      ...SoftWare...
...SYS...
                      ...SYStem...
...T...
                      ...Transformer...
...TEMP...
                      ...TEMPerature...
...TR...
                      ...TRigger...
```

(update 06/04/93)

8.2

```
...TX... ...Transmit(ter)...
```

...V... ...Vertical... or ...Voltage...

...VAL... ...VALue...
...VAR... ...VARiable...
...VID... ...VIDeo...
...WH... ...WHite...

...WHUN... ...WHite Uniformity...
...XTND... ...EXTeNDed...
...XMTR or TX... ...TransMiTteR...

...Y... ...Yoke...

* scaled adjust voltage (ex.: GLOLADJ*, VLINADJ*, ...) or

variant version of a particular signal

Oi

 $\begin{array}{lll} \text{oc} & & \text{open collector line} \\ \text{int} & & \text{interrupt line} \\ \text{uC or } \mu\text{C} & & \text{microController} \\ \text{uP or } \mu\text{P} & & \text{microProcessor} \end{array}$

J../.. connector or Jack / pin ..

name1 P - name2 P ex.: NMBLP-AKBBLP (name1 = NMBL, name2 = AKBBL)

active low Mixed BLanking Pulse, except during AKB BLanking time

Note1: all digital signals (control lines, info lines, timing pulses, ...) are 0-5 V signals, except

otherwise noticed by a suffix indicating the voltage level (f.e.: ...P15 is a timing pulse

with levels between 0 and 15 V).

Note2: all **ADJust voltages** are 0...+10 V analog control signals, except otherwise noticed by

an asterisk (*).

COMPOUND

A1-15 Address line 1...15

ACIA Asynchronous Communication Interface Adaptor

ADJ ADJust voltage
AKBBLP AKB BLanking Pulse
AKBCLP AKB CLaMPing Pulse
AKBMP AKB Measuring Pulse

AKBOFF Automatic Kinescope Biasing OFF AKBREMOVADJ AKB REMOVal ADJust voltage

AMBLSENS AMBient Light SENSor AMV Astable MultiVibrator

AXWHUNADJ AXial WHite UNiformity ADJust voltage

AXWHUNCL AXial WHite UNiformity CoiL
BAKBBLP Blue AKB BLanking Pulse
BAKBM Blue AKB Measurement (signal)
BAUD0-1 BAUD rate 0-1 selection lines

BBIT Blue BIT (signal)
BBITSEL Blue BIT (signal) SELect
BCAGND Blue CAthode GrouND

BCL Beam Current Limit

BERR Bus ERRor

BHILADJ Blue HIghLight ADJust voltage

BIASP BIAS Pulse

BICONHI Blue InterCONnection HIgh BICONLO Blue InterCONnection LOw

BIT Built-In Test

BITLVLADJ BIT LeVeL ADJust voltage
BKG BacKGround (brightness) control
BLOLADJ Blue LOw Light ADJust voltage
BOPT Blue OPTional module signal

BP Back Porch

BPCLSEL Not-Back Porch (/sync tip) Clamp SELect

BPICADJ Blue PICture ADJust voltage

BSUELIMADJ Blue Set Up ELIMination ADJust voltage

CAL CALibrated

CCID Colour Calibrated Imaging Display

CHASGND CHASsis GrouND

CLK CLocK

CLP CLamping Pulse

CLPPRES CLamping Pulse PRESent
CPU Central Processing Unit
CS Composite (H & V) Sync
CTRLDATIN COnTRoL DATa INput
CY CYan or Convergence Yoke

D0-15 Data line 0...15

DAC Digital-to-Analog Convertor

DAC0-9 DAC line 0...9

DACREFADJ DAC REFerence ADJust voltage

DEGCL DEGauss CoiL

DEGENP DEGauss ENable Pulse
DEMUX DeMUltipleXing (-er)

DEMUXA0-3 DEMUltipleXer Address line 0...3
DIFFINP DIFFerential INPut (submodule)

DM Data Mode

DYNFOCUS DYNamic FOCUS

E E clock

E2PROM (EEPROM) Electricaly Eraseable Programmable ROM

ECLOCK Enable CLOCK EHT Extreme High Tension

EPROM Eraseable Programmable ROM

FF Flip-Flop
FILHI FILament HIgh
FILLO FILament Low

FOCUS 1 FOCUS 1 voltage (VG3-1) FOCUS 1 ADJust voltage FOCUS 2 FOCUS 2 voltage (VG3-2) FOCUS 2 ADJust voltage

FP Front Porch G Green

GAKBBLP Green AKB BLanking Pulse GAKBM Green AKB Measurement (signal)

GBIT Green BIT (signal)
GBITSEL Green BIT (signal) SELect
GCAGND Green CAthode GrouND
GENDIAGN GENeral DIAGNostic (line)
GHILADJ Green HIghLight ADJust voltage
GICONHI Green InterCONnection HIgh

8.4

GICONLO Green InterCONnection LOw
GLOLADJ Green LOw Light ADJust voltage
GOPT Green OPTional module signal
GPICADJ Green PICture ADJust voltage

GSUELIMADJ Green Set Up ELIMination ADJust voltage
HAMPLADJ Horizontal AMPLitude ADJust voltage
HBLADJ Horizontal BLanking ADJust voltage
HBLSTOPADJ Horizontal BLanking STOP ADJust voltage
HBLSTRTADJ Horizontal BLanking START ADJust voltage

HBOWADJ Horizontal BOWing ADJust voltage
HDEFLFEEDB Horizontal DEFLection FEEDBack signal

HDEFLHI Horizontal DEFLection HIgh HDEFLLO Horizontal DEFLection Low HDEFLOK Horizontal DEFLection OK!

HDFAMPLADJ Horizontal Dynamic Focus AMPLitude ADJust voltage HDFTILTADJ Horizontal Dynamic Focus TILT ADJust voltage

HDY Horizontal Deflection Yoke
HFLYBINFO Horizontal FLYBack INFOrmation
HFLYBP Horizontal FLYBack Pulse

HLINADJ Horizontal LINearity ADJust voltage HPARABADJ Horizontal PARABola ADJust voltage HPHASEADJ Horizontal PHASE ADJust voltage

HPOSPOL Horizontal Positive Polarity

HS/CS Horizontal Sync or Composite Sync (input)

HS/CSICON Horizontal Sync or Composite Sync InterCONnection

HS/CSP Horizontal Sync or Composite Sync Pulse
HSCORRSEL0-3 Horizontal S-CORRection SELect 0...3
HSHIFTADJ Horizontal SHIFT ADJust voltage
HSKEWADJ Horizontal SKEWing ADJust voltage

HSP Horizontal Sync Pulse

HTRAPADJ Horizontal TRAPezium ADJust voltage

HVDFPARAB Horizontal & Vertical Dynamic Focus Parabola

HWBLANK HardWare BLANK
HWEHTDIS HardWare EHT DISable
I2C or IIC Inter Integrated Circuit bus

IMBInter Monitor BusIRQInterrupt ReQuestLCDLiquid Crystal Display

LD Load Data
LPF Low Pass Filter
MA MAgenta

MBLP Mixed BLanking Pulse
MIS Magnetic Immune System

MISCL1 MIS CoiL 1
MISCL2 MIS CoiL 2
MISSEL MIS SELect

MMV Monostable MultiVibrator MONDATOUT MONitor DATa OUTput MPRD Multi Purpose Rugged Display

MRX/STX-A (+) Master Receive or Slave Transmit positive MRX/STX-B (-) Master Receive or Slave Transmit negative MTX/SRX-A (+) Master Transmit or Slave Receive positive MTX/SRX-B (-) Master Transmit or Slave Receive negative

MVPEAKP Mixed Vertical PEAK Pulse

N... Not-... (active low signal or inverted pulse)

8.5

NAKBBLP Not-AKB BLanking Pulse NAKBMP Not-AKB Measuring Pulse

NAS Not-Address Strobe

(update 06/04/93)

NC Not Connected

NC/NTBU Not Connected and Not To Be Used

NCTS Not-Clear To Send
NDCD Not-Data Carrier Detect
NDEGREQP Not-DEGauss REQuest Pulse

NDEMUXEN0-1 Not-DEMUltipleXer ENable line 0...1

NDRVR422EN Not-Driver (RS) 422 ENable NDTACK Not-Data Transfer ACKnowledge

NE2PROMSEL
NOt-E2PROM SELect
NEPROMSEL
NOt-EPROM SELect
NIACK
NOt-Interrupt ACKnowledge
NIOSEL
NOt-Input/Output SELect
NIPL0-2
NIRQ
Not-Interrupt ReQuest

NIRQ
Not-Interrupt Request
NLDS
Not-Lower Data Strobe
NMANDEGP
Not-MANual DEGauss Pulse
NMBLP
Not-Mixed BLanking Pulse
NMTXSEL
Not-Master Transmit SELect
NPERI8SEL
Not-Peripheral 8 (bit) SELect

NPIAIROA Not-PIA IRO A(side) Not-PIA IRQ B(side) **NPIAIRQB** NR/W Not-Read / Write **NRES** active low RESet **NRTS** Not-Request To Send **NSCLDRIVE** Not-Serial CLock DRIVEr **NSDADRIVE** Not-Serial DAta DRIVEr **NSRAMSEL** Not-Static RAM SELect

NSRX/MRXSEL Not-Slave Receive / Master Receive SELect

NSTXSEL Not-Slave Transmit SELect

NSYSIRQP Not-SYStem Interrupt ReQuest Pulse

NTBU Not To Be Used
NUDS Not-Upper Data Strobe
NVDEFLOK Not-Vertical DEFLection OK
NVMA Not-Valid Memory Address
NVPA Not-Valid Peripheral Address

NWE Not-Write Enable
OPTBIT OPTional BIT (signal)
OPTBITSEL OPTional BIT SELect

OPTRXDTA OPTional module Receive DaTA line

OPTSEL OPTional module SELect

OPTTXDTA OPTional module Transmit DaTA line
OS Optical Sensor (OPTISENSE®)

OSC OSCillator

OSDATA Optical Sensor DATA
PATTSEL0-2 PATTern SELect 0...2
PIA Peripheral Interface Adaptor
PIC PICture (contrast) control
PLL Phase Locked Loop

PR1 or PRE1 PREset 1
PR2 or PRE2 PROTD PROTecteD

PROTGND PROTective GrouND

PWMTRP Pulse Width Modulator TRigger Pulse

R/NW Read / Not-Write

RAKBBLP Red AKB BLanking Pulse
RAKBM Red AKB Measurement (signal)
RAM Random Access Memory

RBIT Red BIT (signal)

(update 06/04/93)

8.6

RBITSEL Red BIT (signal) SELect RCAGND Red CAthode GrouND

RD Receive Data

REFSEL0-1 REFerence SELect line 0...1

REMIO REMote Input/Output I2C interface IC
REMRXTXCLK REMote Receive Transmit CLock
RHILADJ Red HIghLight ADJust voltage
RICONHI Red InterCONnection HIgh
RICONLO Red InterCONnection LOw
RLOLADJ Red LOw Light ADJust voltage

ROM Read Only Memory

ROPT Red OPTional module signal RPICADJ Red PICture ADJust voltage

RR Receiver Ready

RSUELIMADJ Red Set Up ELIMination ADJust voltage

SCL Serial CLock (I2C)

SD Send Data

SDA Serial DAta (I2C)
SDI Serial Data Input
SOG Sync On Green
SRAMP S corrected RAMP

ST Sync Tip STRTUP STaRT-UP

STX/MRX Slave Transmit / Master Receive

SWBLANK SoftWare BLANK
SWEHTDIS SoftWare EHT DISable
SYN&SCA SYNc & SCAling (submodule)

TBD To Be Defined TR Terminal Ready

VAMBLSENS Voltage from AMBient Light SENSors VAMPLADJ Vertical AMPLitude ADJust voltage

VBCATHODE Voltage on Blue CATHODE
VBLADJ Vertical BLanking ADJust voltage

VBLP Vertical BLanking Pulse
VDEFLHI Vertical DEFLection HIgh
VDEFLLO Vertical DEFLection LOw

VDFAMPLADJ Vertical Dynamic Focus AMPLitude ADJust voltage VDFTILTADJ Vertical Dynamic Focus TILT ADJust voltage

VDY Vertical Deflection Yoke

VG1 Voltage Grid 1 VG2 Voltage Grid 2

VG3-1 Voltage Grid 3-1 (Static Focus)
VG3-2 Voltage Grid 3-2 (Dynamic Focus)
VGCATHODE Voltage on Green CATHODE

VMA Valid Memory Address
VMIDP Vertical MID Pulse
VPA Valid Peripheral Address
VPOSPOL Vertical POSitive POLarity
VRAMP Vertical RAMP signal
VRCATHODE Voltage on Red CATHODE
VS Vertical Sync (input)

VSCORRADJ Vertical S-CORRection ADJust voltage

VSHIFTADJ Vertical SHIFT ADJust voltage

VSHIFTCORRADJ Vertical SHIFT CORRection ADJust voltage

VSICON Vertical Sync InterCONnection

VSP Vertical Sync Pulse

VWHUNADJ Vertical WHite UNiformity ADJust voltage

VWHUNCL Vertical WHite UNiformity CoiL

WDOG Watch DOG WH WHite

WHUNCL WHite UNiformity CoiL

YE YEllow 8.7 (update 06/04/93)

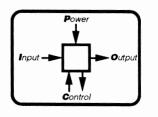
9. OPTIONAL MODULES

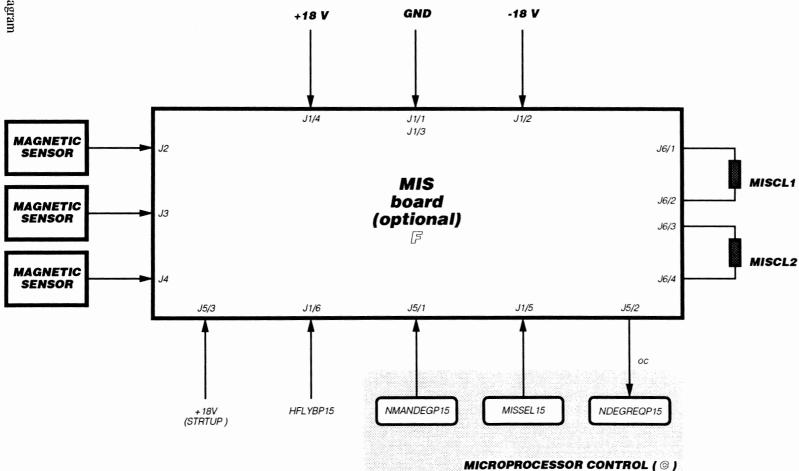
9.1 MIS BOARD

General

The Magnetic Immune System compensates magnetic fields up to 5 Gauss with a maximum frequency of 0,5 Hz.

MPRD 9600 MIS (Magnetic Immune System) board 5 22sep91





9.1.2 PCB LAYOUT

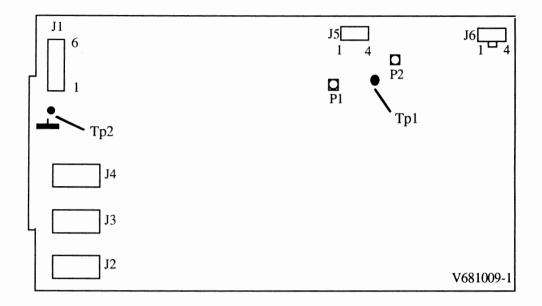


figure 9.2: MIS board component side

9.1.3 BACKBOARD CONNECTIONS

MIS Connector J1 is connected with BACKBOARD Connector J10.

J10 pin nr	signal name	to	from
1	GND		P
2	-18 V		P
3	GND		P
4	+18 V		P
5	MISSEL 15		G
6	HFLYBP15		G

MIS Connector J5 is connected with BACKBOARD Connector J11.

J11 pin nr	signal name	to	from
1	NMANDEGP15		G
3	NDEGREQP15 oc +18 V (STRTUP)	G	J10/4

9.1.4 MIS BOARD INTERCONNECTION SPECIFICATIONS

Connection between MIS Board and Backboard

MIS Board connector J1 (6 pins) is connected to Backboard connector J10. MIS Board connector J5 (4 pins) is connected to Backboard connector J11.

Connection between MIS Sensors and MIS Board

The 3 MIS sensors are connected to J2, J3 and J4 on the MIS board. Connection between MIS Board and WUA coils 1 & 2

WUA coil 1 is connected to pin 1 & 2 of J6, WUA coil 2 is connected to pin 3 & 4 of J6.

9.1.5 MIS BOARD ADJUSTMENT

Place the display in a varying magnetic field, connect an oscilloscope to Tp1 (Tp2 = ground).

Position the display such that the coils are in lateral direction against the display, send an LF current through the coils. Adjust P1 for minimum variation reading on the oscilloscope.

Position the display such that the coils are in axial direction (same centerline of CRT and coils) and send an LF current through the coils.

Adjust P2 for minimum rotation and shift of the displayed picture.

Disconnect the oscilloscope and apply a magnetic field in three directions, degauss the display and check if the MIS board functions correctly.

9.2 OPTIONAL INPUT BOARD

General

The optional input board allows to connect a second RGB source to the MPRD9643/51.

Loopthrough Version

This board has R, G, B and composite sync inputs with loopthrough.

The ROPT, GOPT, BOPT outputsignals of this board always have sync on green.

Terminated Version

This board has R, G, B and composite sync inputs erminated in 75Ω .

The ROPT, GOPT, BOPT outputsignals of this board always have sync on green.

MPRD 9600 OPTIONAL INPUT board [] 22sep91

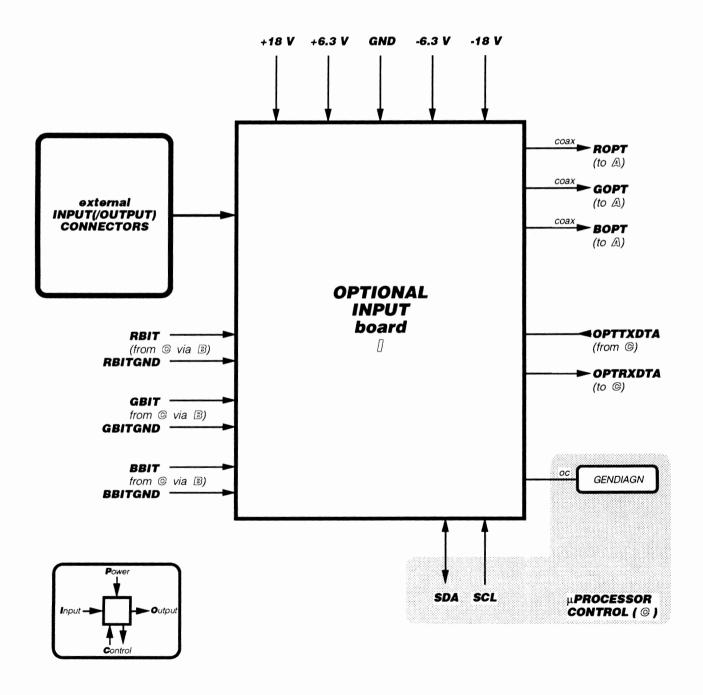
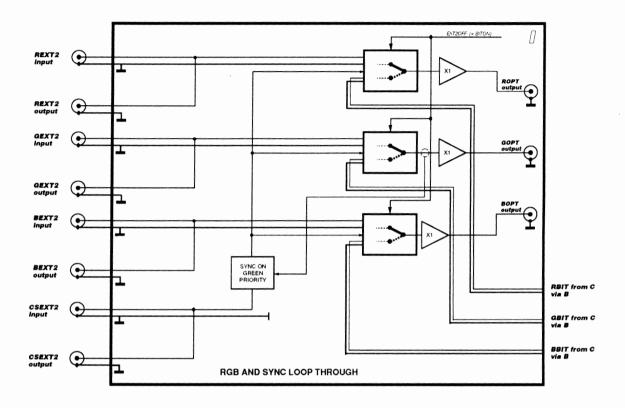


figure 9.3: OPTIONAL INPUT board IOPC diagram

9.2.2 BLOCK DIAGRAM

MPRD 9643/51 OPTIONAL INPUT 1 17dec 92



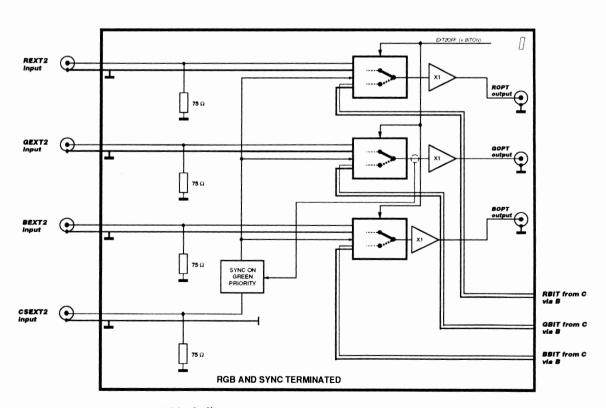


figure 9.4: OPTIONAL INPUT board block diagram

9.2.3 CIRCUIT DESCRIPTION

As the R.G and B channel are identical, only the G channel will be described.

Jumper W1,2,3,4 and 5 are not mounted.

RGB and Sync Loop through version

sheet 1 of 3

The signal enters via J17, via a loop through filter (printed coils) the signal arrives at J16 and must be terminated (externally) in 75Ω .

RGB and Sync Terminated

sheet 1 of 3

The signal enters via J17, via a loop through filter (printed coils) the signal arrives at J16 (J16 is replaced by a 75Ω resistor).

Via C46,R97 the G signal is connected to the differential amplifier Q18,17 (C104,105 are not mounted!). R85,95 bias for the bases of Q17,18.

The temperature compensated constant current source Q10,D56 is connected to Q12,13. Only one of both (Q12,13) can be on, depending on the level of EXT2OFF.

When EXT2OFF is high, Q37 will be saturated, the collectorcurrent goes through D54, R179,180, the cathode of D54 will be at -7,3V and the b-e junction of Q12 will conduct. As Q37 is saturated there will be 0,7V on the collector, the base of Q38 will be at 0,4V, Q38 is off, the voltage drop over R177 is 0V and the b-e junction of Q13 is biased in reverse direction, Q13 is off and so are Q17,18.

The current source is connected to R72,71 via Q12; GBIT,GBIT GND is selected. As the base of Q12 is on a fixed potential, the emittervoltage of Q12 and the collectorvoltage of Q10 will not change; Q10 will not be modulated when Q15,14 are driven with a common mode signal, increasing the common mode rejection. The amplification is determined by R72,71; R61,C48 increase the amplification in the low frequency range; R78,82 increase the stability. Only part of the current through R60 goes through Q14, the other part goes through Q16. The base of Q16 is forced to a fixed potential by R74,73, D24,27, and so is the emitter; the current through R60 will be constant as well. Only part of the current through R59 goes through Q15, the other part goes through Q11. The base of Q11 is forced to a fixed potential by R74,73,D24,27, and so is the emitter; the current through R59 will be constant as well. This means that the differential amplifier Q14,15 is fed by a constant current and voltage, eliminating feedback, increasing high frequency stability by lowering the influence of the Miller capacitor.

The voltage differences at the input of the differential amplifier are converted into a current difference through Q11. The collectorcurrent of Q16 is converted into a voltage by R93, and buffered by Q19, an emitterfollower with low outputimpedance (not very sensitive to capacitive loads); D26 ensures temperature stabilisation for Q19. The outputsignal present across R92 is connected to U12 via R96,C54. U12 is a 75 Ω driver, the signal leaves at pin 8 and is available at J3.

Protection circuits

D28,29,30,31 limit the input voltages on the bases of Q14,15,17,18; R89,91,94,97 limit the current through the diodes during flash.

C59,60, connected to the low inputs, short undesired high frequency components.

Sync on green

sheet 1 of 3

The collectorcurrent of Q11 is converted into a voltage by R70, and inverted by Q20 because the other side of the differential amplifier was taken as signalsource; D25 ensures temperature stabilisation for Q20. The outputsignal SOG is present across R87.

sheet 2 of 3

The SOG signal coming from Q20 via C58 is buffered by Q32 and DC-restored (R136,138,C6) and clamped (C13,D41). Q31 amplifies approximately 3 times to increase noise immunity; the collectorsignal is clamped by C85,D42, R148 stabilizes the current through D42 to reduce phase jitter. The input of comparator U4.pin4 is only driven by the sync pulses.

RGB and Sync Loop through version

sheet 2 of 3

The signal enters via J21, via a loop through filter (printed coils) the signal arrives at J20 and must be terminated (externally) in 75Ω .

RGB and Sync Terminated

sheet 2 of 3

The signal enters via J21, via a loop through filter (printed coils) the signal arrives at J20 (J20 is replaced by a 75Ω resistor).

Composite sync

Via C5,R154 the CS signal is connected to the differential amplifier Q33,34

The temperature compensated constant current source Q30,D40 is connected to Q33,34.

Via C87 the signal is connected to a pulseshaper U16,pin7,9,10 to reduce the risetime of the CS signal, followed by an autopolarizing circuit U5,pin11,12,13,R8,151,C15. Independent from the sync polarity, U5,pin11 will deliver positive sync output. Negative sync polarity will charge C15, U5 will invert the signal on pin12, positive sync will not charge C15, U5 will buffer the signal on pin12.

Sync priority system.

If internal sync is present on this second G input, it will be used, external sync has no priority on the second input board.

If sync on green is present, U5,pin6 will be low, U3,pin14 will be low and U3,pin4 remains on +5V.

IF no sync on green is present, U5,pin6 will be high, U3,pin14 is connected to autopolarised CS signal (U5,pin11). U3,pin3,4,5,9 now acts as an invertor. The signal at U3,pin4 is used to modulate the current through Q16 superposing the sync signal on the G channel.

A signal with external sync connected to the optional input board, is sent to the RGB board with sync on green.

Composite sync Inhibit

When selecting BIT, INH will go high, disabling U3. This function is required because the CS signal of the second video inputs is not synchronised with the BIT generator. This would lead to a failing sync on green detection for BIT and the CS-signal would be superposed on the sync-signal of BIT.

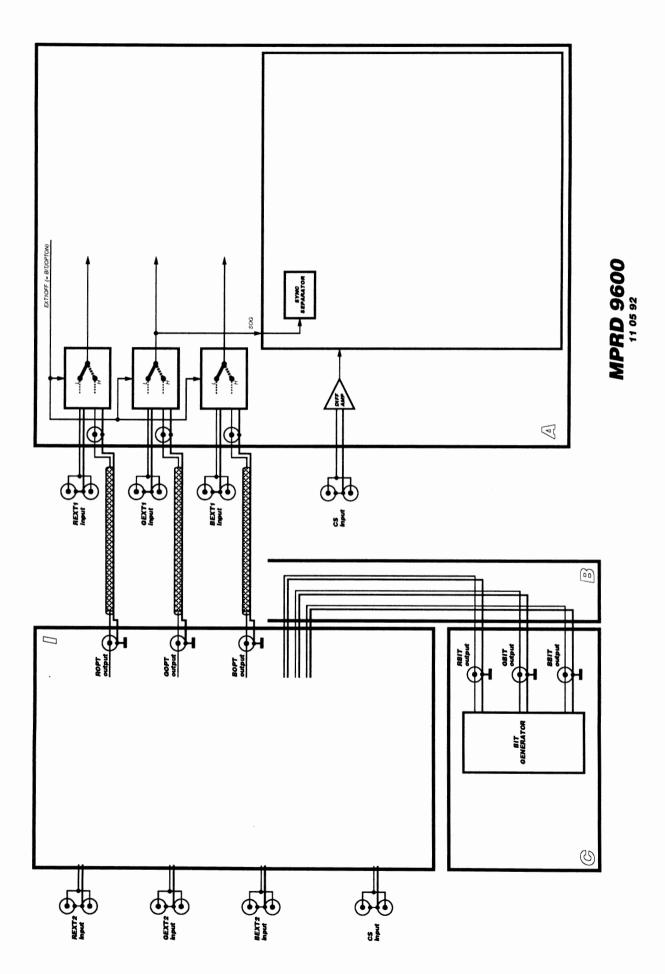


figure 9.5: INPUT SWITCHING with OPTIONAL INPUT BOARD

9.2.4 PCB LAYOUT

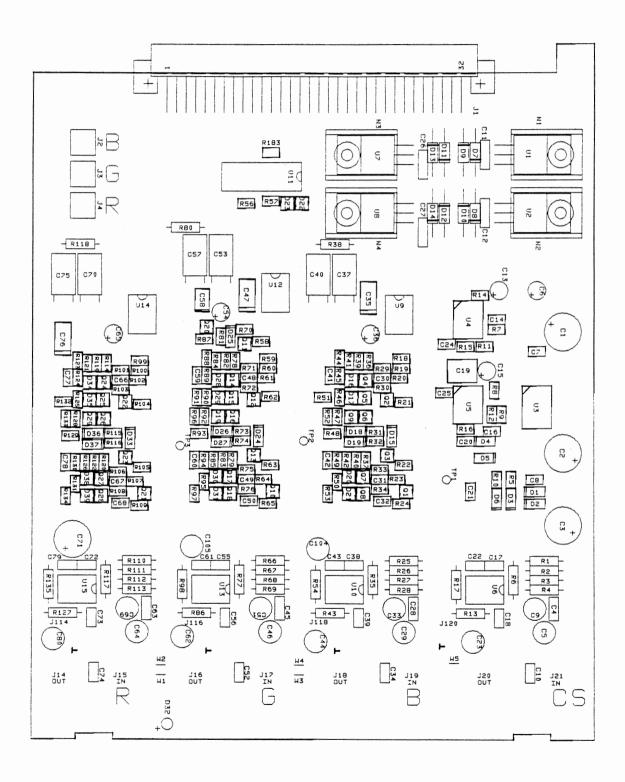


figure 9.6 : OPTIONAL INPUT board component side

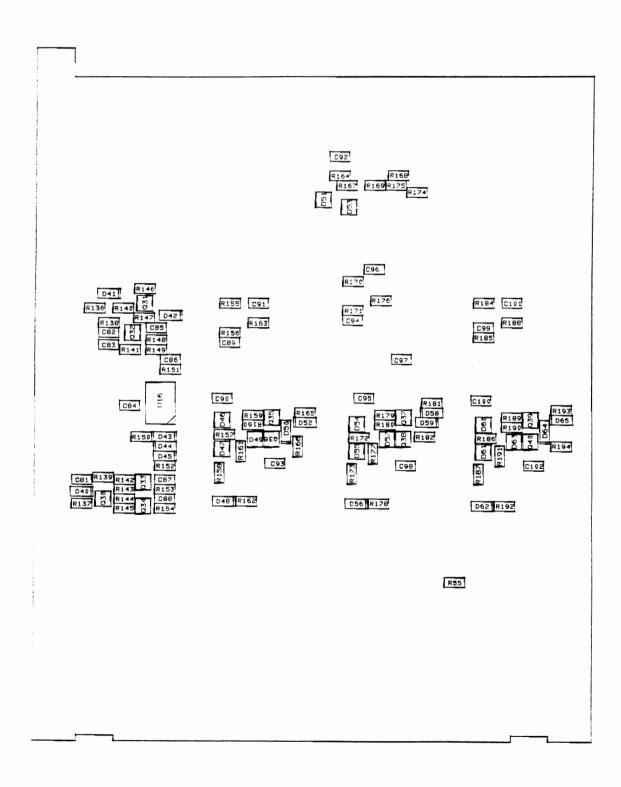


figure 9.7 : OPTIONAL INPUT board solder side

9.2.5 PARTS LIST

Order number of a complete OPTION INP BNC: V5631165 Date: 01/12/92 Order number Description Item V1012231 R MF H 75E J 0W5 R118, R38, R80 V1114529 C EL RA 470M M 10E2 105 C3 ,C71 V1114750 C36 ,C54 ,C65 C EL RA 15M M 25E1 125 V111478 C EL RA 220M M 25E2 105 C1 ,C2 C15 V1114932 C EL RA 4M7M 50E1 105 V1114942 C EL RA 10M M 50E1 105 C13 ,C6 C EL BRA 22M M 25E2 85 C23 ,C29 ,C37 ,C40 ,C44 ,C46 , V111681 c5 ,c53 ,c57 ,c62 ,c64 ,c70 , C75 ,C80 C NP0 MI 15P G 63E2 C28 ,C4 ,C45 ,C63 V112232 C11 ,C12 ,C26 ,C27 V1127930 C X7R MU 1M K 50E2 125 C COG MU 220P J500E2 125 C10 ,C34 ,C52 ,C74 V1137160 C131646 D 1N4007 R DO41 D10 ,D11 ,D12 ,D13 ,D14 ,D7 , D8 , D9 D LED D3 T YEL HLMP V131670 D32 N1 ,N2 ,N3 ,N4 V1330911 Q ACC HTSNK 55 K TO220 V1340022 U 7812 T0220 P U8 V1340162 U 2990-12 LM TO220 M U7 V1340281 U 2990-5 LM TO220 M U1 U 2940-5 LM TO220 P V134044 IJ2 U 581D SI DIP8 U12 ,U14 ,U9 V1342221 Ι DIP16 P U 8574A PCF V1372951 U11 V311061 D ACC HLDR D3 P1 TS H 6.5 0060 J BNC 0030 FCT P 1 50E S V3131400 V313202 J SMB MBT P 1 50E J2 ,J3 ,J4 J BNC ACC WHSR V3133691 0032 J U0.3 FBT P16 E1AU TLP 0070 V3134951 V313525 J EUR3C MBS P64 E1C2 S1.6 J1V315317 SLDRLUG SCR 1TAG D9.7 L24 0031 V342168 WIRE AWG24 UL1007 WHI Y 0033 SMP-I M2.5X10 D 84 0050 V3620146 V3620216 SMP-I AM3 X 6 D 84 0026,0041 NUT DIN934 I M2.5 V3661106 0052 0040 NUT M3 PC BOARDS V366940 0051 V3673896 WASHER INOX M2.5DIN137 Y V3673906 WASHER CRINKLE I M3 0027,0042 V367650 MOUNTING BRACKET 0025 V6030961 CAPTIVE SCREW M3 X 8 00 0021 V6030963 CAPTIVE SCREW SPRING 01 0022 V603592 SEC. INPUTPANEL BNC 01 0020 V681033 SMD OPT.INPUT MPRD9000 00 0010 V716543 PCB TESTPOINT 05 TP1 , TP2 , TP3

Order number of a	complete SMD OPTION	INP: V681033	Date: 01/12/92
Order number	Description		Item
P200025	R# CE H 10E J (W12 1206	R155,R156,R170,R171,R184,R185
P200033	R# CE H 22E J 0	W12 1206	R104,R105,R21 ,R22 ,R62 ,R63
P200043	R# CE H 56E J 0	W12 1206	R133,R165,R181,R193,R52 ,R96
P200049	R# CE H100E J 0	W12 1206	R115,R124,R130,R132,R134,R149,
			R158,R164,R167,R173,R187,R31,
			R45 ,R49 ,R51 ,R53 ,R73 ,R89 ,
			R91 ,R94 ,R97
P200053	R# CE H150E J 0)W12 1206	R140,R58
P200055	R# CE H180E J 0	W12 1206	R142,R144
P200057	R# CE H220E J 0)W12 1206	R128,R129,R47 ,R48 ,R70 ,R92 ,
			R93
P200061	R# CE H330E J 0)W12 1206	R183
P200065	R# CE H470E J C)W12 1206	R147,R153,R154,R81 ,R87
P200067	R# CE H560E J 0)W12 1206	R55
P200071	R# CE H820E J 0)W12 1206	R137
P200073	R# CE H 1K J 0	W12 1206	R116,R12 ,R14 ,R15 ,R151,R162,
			R178,R192,R32 ,R74
P200075	R# CE H 1K2 J 0	W12 1206	R143,R145,R7
P200077		W12 1206	R136
P200079	R# CE H 1K8 J 0	W12 1206	R139
P200081	R# CE H 2K2 J 0	W12 1206	R146
P200085	R# CE H 3K3 J 0	W12 1206	R123,R44 ,R88
P200089	R# CE H 4K7 J 0	W12 1206	R8
P200093	R# CE H 6K8 J 0	W12 1206	R109,R160,R166,R180,R182,R190,
			R194,R24 ,R65
P200095		W12 1206	R102,R107,R20 ,R23 ,R61 ,R64
P200097	R# CE H 10K J 0	W12 1206	R11 ,R138,R150,R168,R169,R174,
			R175,R56 ,R57
P200105	R# CE H 22K J 0	W12 1206	R10 ,R121,R125,R126,R131,R41 ,
			R42 ,R46 ,R5 ,R50 ,R84 ,R85 ,
			R90 ,R95
P200111		W12 1206	R141,R9
P200113		W12 1206	R163,R176,R188
P200121	R# CE H100K J 0		R157,R172,R186
P200129		W12 1206	R159,R161,R177,R179,R189,R191
P200131		W12 1206	R152
P200143		W12 1206	R16
P200145		W12 1206	R148
P200381	R# CE H 56E F 0	W12 1206	R114,R119,R120,R122,R36,R37,
			R39 ,R40 ,R78 ,R79 ,R82 ,R83
P200387	R# CE H100E F 0	W12 1206	R101,R103,R106,R108,R29,R30,
			R33 ,R34 ,R71 ,R72 ,R75 ,R76
P200399	R# CE H330E F 0		R100,R18 ,R19 ,R59 ,R60 ,R99
P210013	C(S)CEC1CH1206CC		C30 ,C31 ,C48 ,C49 ,C66 ,C67
P210067	C(S)CEC2CH2321X7		C19
P210092	C(S)CEC2CH1206X7		C16 ,C20
P210122	C(S)CEC2CH1206X7	K104K 50	C100,C101,C102,C14 ,C21 ,C24 ,

475M 16

106M 16

C88

C58

C35 ,C47 ,C76

C(S)CEC2CH1206X7R153K 50

C(S) TACH3528

C(S) TACH6032

P210152

P212006

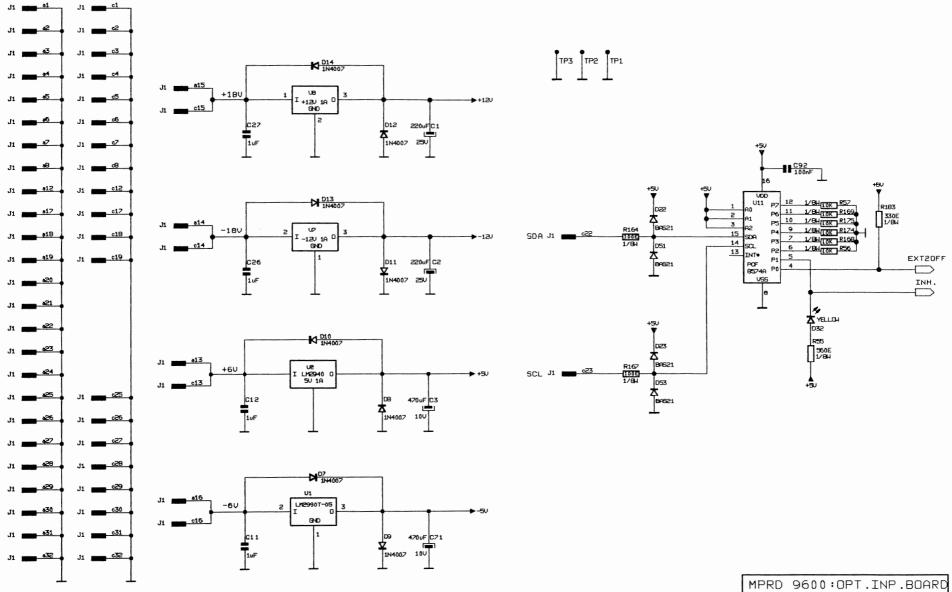
P212018

C25 ,C32 ,C50 ,C68 ,C7 ,C8 , C81 ,C82 ,C83 ,C84 ,C85 ,C86 , C87 ,C89 ,C90 ,C91 ,C92 ,C93 , C94 ,C95 ,C96 ,C97 ,C98 ,C99

C41 ,C42 ,C59 ,C60 ,C77 ,C78 ,

Order number	Description	Item
P230465	SMC(S)ICHCT74HCT4053 SO16	U3
P230478	SMC(S)ICHCT 74HCT86 SO14	U5
P230488	SMC(S)ICCOM LM219 SO14	U16 ,U4
P232004	SMC(S)TRA BC849C	Q1 ,Q10 ,Q12 ,Q13 ,Q2 ,Q21 ,
		Q22 ,Q23 ,Q3
P232051	SMC(S)TRA BC847B	Q30
P232067	SMC(S)TRA BC857C	Q32
P232069	SMC(S)TRA BT2369	Q31 ,Q33 ,Q34
P232090	SMC(S)TRBB BFR92A SOT23	Q14 ,Q15 ,Q17 ,Q18 ,Q19 ,Q20 ,
		Q24 ,Q25 ,Q27 ,Q28 ,Q29 ,Q4 ,
		Q5 ,Q7 ,Q8 ,Q9
P232091	SMC(S)TRBB BFT92 SOT23	Q11 ,Q16 ,Q26 ,Q6
P232101	SMC(S)TRPNP BC859C SOT23	Q35 ,Q36 ,Q37 ,Q38 ,Q39 ,Q40
P234013	SMC(S)DIOZEN BZX84C4V7	D46 ,D47 ,D54 ,D55 ,D60 ,D61
P234018	SMC(S)DIOZEN BZV55C6V2	D19 ,D27 ,D37
P234047	SMC(S)DIO BAV99	D16 ,D17 ,D20 ,D21 ,D28 ,D29 ,
		D30 ,D31 ,D34 ,D35 ,D38 ,D39
P234055	SMC(S)DIO BAT54	D49 ,D57 ,D63
P234099	SMC(S)DIO 4148	D1 ,D15 ,D18 ,D2 ,D24 ,D25 ,
		D26 ,D3 ,D33 ,D36 ,D4 ,D41 ,
		D42 ,D43 ,D44 ,D45 ,D48 ,D5 ,
		D50 ,D52 ,D56 ,D58 ,D59 ,D6 ,
		D62 ,D64 ,D65
P234127	SMC(S)DIZEN BZV55C5V1 DMM	D40
P234195	SMC(S)DI BAS21 SOT23	D22 ,D23 ,D51 ,D53
P905185	PRINT - P1455185	S

9.2.6 SCHEMATIC DIAGRAM



MPRD	9600:0	PT.INP.BOARD		
	LV-POWER			
V5631165				
SHEET 30F3 T				

2.9.7 BACKBOARD CONNECTIONS

OPTIONAL INPUT BOARD Connector J1 is connected to BACKBOARD Connector J2.

a-side	signal			[c-side	signal		
pin nr	name	to	from		pin nr	name	to	from
				(0.4.0)				
	GND		P	(CAD) 33	1	GND	Ι	P
2	GND		P	34	2	GND		P
3	GND		P	35	2 3	GND		P
4	GND		P	36	4	GND		P
5	GND		P	37	5	GND		P
6	GND		p	38	6	GND		P
1 7	GND		P	39	7	GND		P
8	GND		P	40	8	GND		P
9	(RBIT)GND		G	41	9	RBIT		G
10	(GBIT)GND		G	42	10	GBIT		G
11	(BBIT)GND		©	43	11	BBIT		G
12	GND		P	44	12	GND		P
13	+6.3 V		P	45	13	+6.3 V		P
14	-18 V	1	P	46	14	-18 V		P
15	+18 V		P	47	15	+18 V		P
16	∙6.3 V		P	48	16	-6.3 V		P
17	GND		P	49	17	GND		P
18	GND		P	50	18	GND		P
19	GND		P	51	19	GND		P
20	GND		P	52	20	OPTTXDTA	_	@
21	GND		P	53	21	OPTRXDTA	G	
22	GND		P	54	22	SDA	CDLMO	GD/LMO
23	GND		P	55	23	SCL		©
24	GND		P	56	24	GENDIAGN oc/int	G	ADELMO
25	GND		P	57	25	GND		P
26	GND		P	58	26	GND		P
27	GND		P	59	27	GND		P
28	GND		P	60	28	GND		P
29	GND		P	61	29	GND		P
30	GND		P	62	30	GND		P
31	GND	'	P	63	31	GND		P
32	GND		P	64	32	GND		P

9.2.8 CUSTOMIZED VERSIONS

OPT. INP. BOARD BNT MPRD 9600 V5631161

Order number of a complete OPT. INP. BOARD BNT MPRD9600: V5631161 00 Date: 06/01/93 Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and OPT. INP. BOARD BNT MPRD9600 V5631161 00

SUBSTITUTES

Order Number	Description	Item
V603592	SEC. INPUTPANEL BNC 01	0020 replaced by
V6035921	SEC. INPUTPANEL TRIAX 01	
V3131400	J BNC FCT P 1 50E S	0030 replaced by
V313150	J BNT FCT P 1 50E	

REMOVED

Item

0031

0032

OPT. INP. BOARD TNC TERM 9600 V5631166

Order number of a complete OPT. INP. BOARD TNC TERM 9600: V5631166 00 Date: 06/01/93 Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and OPT. INP. BOARD TNC TERM 9600 V5631166 00

SUBSTITUTES

Order Number	Description		Item	
V603592	SEC. INPUTPANEL BNC	01	0020	replaced by
V6035926	SEC.INPUTPANEL BNC NLT	0 0		
V3131400	J BNC FCT P 1 50E	S	0030	replaced by
V313150	J TNC FCT P 1 50E			

ADDED

Order Number	Description	Item
V1015231	R MF H 75E F 0W4 E2	R119, R120, R121, R122
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

OPT. INP. BOARD TRIAX MPRD 9600 V5631161

Order number of a complete OPT. INP. BOARD FC722 MPRD9600: V5631965 00 Date: 06/01/93 Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and OPT. INP. BOARD FC722 MPRD9600 V5631965 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

10. PREVENTIVE MAINTENANCE

At least every 2 years, all boards containing electrolytical capacitors need to be powered on during 24 hours minimum.

Make units free of dust whenever necessary.

Cleaning of optical filter: clean the outer filtersurface with a soft cloth and isopropyl alcohol or a mild detergent.

11. REMOVAL AND REINSTALLATION OF ELECTRONIC BOARDS

Refer to figure 1.1 and 1.2 for the board location.

In the text below, right hand side of the display means the right hand side of the display for someone looking towards the front face of the display.

In the text below, left hand side of the display means the left hand side of the display for someone looking towards the front face of the display.

IMPORTANT

Make sure that the display is disconnected from mains power before removing any sub-assemblies.

RGB board

Removal:

- remove the cover from the display by unscrewing 34 captive screws.
- remove the metallic plate, on which the display's identification plate is attached, from the rear of the display by unscrewing the 12 captive screws fixing it to the chassis.
- gently pull the CRT socket board away from the CRT.
- unplug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- unplug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- disconnect the 2 ground wires coming from the RGB board.
- unplug the 3 coax cables coming from the uprocessor unit (top rear of RGB).
- loosen the 2 screws (M3) on the lower part of the RGB module with which the RGB board is fixed to the chassis.
- unplug the 2 flatcables (one connected on the left hand bottom side of the RGB, the other connected on the right hand bottom side of the RGB)
- remove the RGB board from the display by pulling it towards the top of the display.

Reinstallation:

- place the RGB board into the PCB guides and slide into position.
- plug the 2 flatcables (one connected on the left hand bottom side of the RGB, the other connected on the right hand bottom side of the RGB)
- fasten the 2 screws (M3) on the lower part of the RGB module with which the RGB board is fixed to the chassis.
- plug the 3 coax cables coming from the µprocessor unit (top rear of RGB, each cable has a colour code)
- reconnect the 2 ground wires coming from the RGB board.
- plug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- plug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- gently reposition the Crt socket board.
- reinstall the metallic plate, on which the display's identification plate is attached, on the rear of the display, tighten the 12 captive screws.
- install the cover on the display by way of the 34 captive screws.

Deflection board

Removal:

- remove the cover from the display by unscrewing 34 captive screws.
- unscrew the remaining captive screw at the bottom of the deflection board heatsink.
- disconnect the 9-pin connector (deflection coils) from the deflection board.
- disconnect the two 2-pin connectors (degauss coils) from the deflection board.
- pull out the board.

Reinstallation:

- place the deflection board into the PCB guides and slide into position.
- reconnect the two 2-pin connectors (degauss coils) to the deflection board (it is not important how the connection is made; one may choose to which male connector each female connector is connected)
- reconnect the 9-pin connector (deflection coils) from the deflection board.
- tighten the captive screw at the bottom of the deflection board heatsink.
- install the cover on the display by way of the 34 captive screws.

EHT board

Removal:

- remove the SM Power Supply board.
- remove the MIS board (see further).
- disconnect the EHT connection (silicone connector, refer to sticker on connector to know which sid opens); if impossible to pull EHT wire out of connector, cut the silicone connector but be carefull not to damage the EHT wires
- discharge the Eht connection towards the chassis.
- the focus connection towards the CRT socket is made by way of a large connector fixed onto the chassis with a metallic clips; remove the clips by unscrewing 1 captive screw. The focus connector is secured in closed position by 2 small metal clipses. Open the clipses and pull the 2 parts of the focus connector in opposite direction using the FOC CON PINCHER (V603840).
- pull the Eht module towards the rear of the unit over a distance of approximately 1 cm. Now it is possible to disconnect the flatcable that connects the Eht module to the backboard.
- gently pull out the Eht board while guiding the focus connector.

Reinstallation:

- position the wires for the focus connection and Eht connection; before pushing the Eht board completely into its normal position, reconnect the flatcable on the backboard. Push the Eht board in its normal position.
- plug the focus connector, secure the connection by way of the 2 clipses, position the connector onto the chassis, position the metallic clips and fasten with a captive screw.
- reconnect the EHT connector (clean EHT wire with iso propyl alcohol or equivalent and put some silicone compound (order number V3951801) over the end of the EHT wire (approx. 4 cm length); slide the wire into the EHT connector, make sure the tinned end of the EHT wire enters the black conductive part in the center of the connector.
- USE ONLY SILICONE GREASE COMPOUND TO SLIDE EHT WIRE INTO CONNECTOR.
- reinstall the MIS board.
- reinstall the SMPS board.

Microprocessor board

Removal:

- unscrew the 2 captive screws fixing the processorboard to the rear of the display.
- pull out the processor board using the maintenance key (V603790).
- unplug the 3 coax cables, one for each colour R, G, B of the BIT signal (only if the Optional Input board is NOT installed).
- Reinstallation:
- plug the 3 coax cables (a colour code is present on each of the 3 wires).
- push the board back into position.
- fix the board onto the chassis by way of the 2 captive screws at the rear.

SM Power Supply board

Removal:

- remove the cover from the display by unscrewing 34 captive screws.
- unscrew the 2 captive screws at the rear of the Power Supply board.
- pull out the SMPS board.

Reinstallation:

- place the SMPS board into the PCB guides and slide into position.
- fix the SMPS board onto the chassis by way of 2 captive screws.
- install the cover on the display by way of the 34 captive screws.

CRT socket board

Removal:

- remove the display top cover by unscrewing 34 captive screws.
- remove the metallic plate, on which the display's identification plate is attached, from the rear of the display by unscrewing the 12 captive screws fixing it to the chassis.
- gently pull the CRT socket board away from the CRT.
- unplug the cathode wires coming from the CRT socket board (3 x 2-pin connector).
- unplug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- disconnect the 2 ground wires coming from the RGB board.
- disconnect the aquadag from the CRT socket board.
- remove the MIS board.
- the focus connection towards the CRT socket is made by way of a large connector fixed onto the chassis with a metallic clips; remove the clips by unscrewing 1 captive screw. The focus connector is secured in closed position by 2 small metal clipses. Open the clipses and pull the 2 parts of the focus connector in opposite direction using the FOC CON PINCHER (V603840).
- remove the top half of the shielding situated around the neck of the CRT; to do so, unscrew 2 captive screws on top of this shielding and pull the shielding towards the top of the display. Now there is space enough for the focus connector to be slid out of the display when removing the CRT socket board.

Reinstallation:

- gently slide the focus connector through the opening between the CRT neck and the chassis; reinstall the top half of the shielding situated around the neck of the CRT; to do so, reposition this shielding and fix it by way of the 2 captive screws on top.
- plug the focus connector, secure the connection by way of the 2 clipses, position the connector onto the chassis, position the metallic clips and fasten with a captive screw.
- reinstall the MIS board.
- reconnect the aquadag.
- reconnect the 2 ground wires coming from the RGB board.
- plug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- plug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- gently reposition the Crt socket board.
- reinstall the metallic plate, on which the display's identification plate is attached, on the rear of the display, tighten the 12 captive screws.
- install the cover on the display by way of the 34 captive screws.

Control board

Removal:

- unscrew 12 screws M4 with which the bezel is fixed on the μ-metal shielding and carefully withdraw
 the bezel from the front of the CRT. Disconnect the flatcable on the right bottom side on the inner side
 of the bezel. Be careful not to damage the front face filter.
- unscrew the control panel from the bezel

Reinstallation:

- install the control panel in the bezel by using the M2,5 screws; use loctite 242E to fix the screws properly.
- reconnect the flatcable to the connector on the control board.
- reinstall the front face bezel.

CRT assembly

Removal

- remove the display top cover by unscrewing 34 captive screws.
- remove the front face bezel (12 screws M4) and disconnect the flatcable from the control panel board.
- remove the MIS board.
- remove the RGB board.
- disconnect the aquadag from the CRT socket board.
- unscrew 4 screws M3x6 with which the μ -metal shielding, situated around the neck of the Crt, is fixed onto the chassis.
- remove the deflection board.
- remove the Eht and SM Power Supply board.
- the rackmounting is fixed onto the CRT μ-metal shield on left and right hand side by way of 3 screws
 M4 on each side. Unscrew these screws.
- the wires which leave from the 2 MIS-sensors, mounted on the left hand side and right hand side of the μ-metal screen, are fixed on the chassis by way of a cable clamp. Remove these cable clamps (1 screw M3 for each sensor)
- the μ -metal shield and the CRT are fixed onto the chassis; by unscrewing 4 captive screws M4 and 4 other screws M4, the complete CRT assembly is detached from the chassis.

Reinstallation:

- install the CRT assembly on the chassis (4 captive screws M4 and 4 standard screws M4).
- fix the wires of the 2 Mis-sensors with their cable clamps onto the chassis.
- reinstall the rackmounting on the μ-metal screen.
- reinstall the Eht and SM Power Supply board.
- reinstall the deflection board.
- fix the rear side of the μ -metal shielding on the chassis by way of 4 screws M3x6.
- reconnnect the aquadag to the CRT socket board.
- reinstall the RGB board.
- reinstall the MIS board.
- reinstall the front face bezel; connect the flatcable to the control panel board.
- install the cover on the display by way of the 34 captive screws.

MIS board

Removal:

- remove the display top cover by unscrewing 34 captive screws.
- remove from the chassis the metallic part on which the MIS board is mounted by unscrewing 4 captive screws.
- disconnect the connectors from the MIS module.
- remove the board from its metallic mounting (2 screws M3)

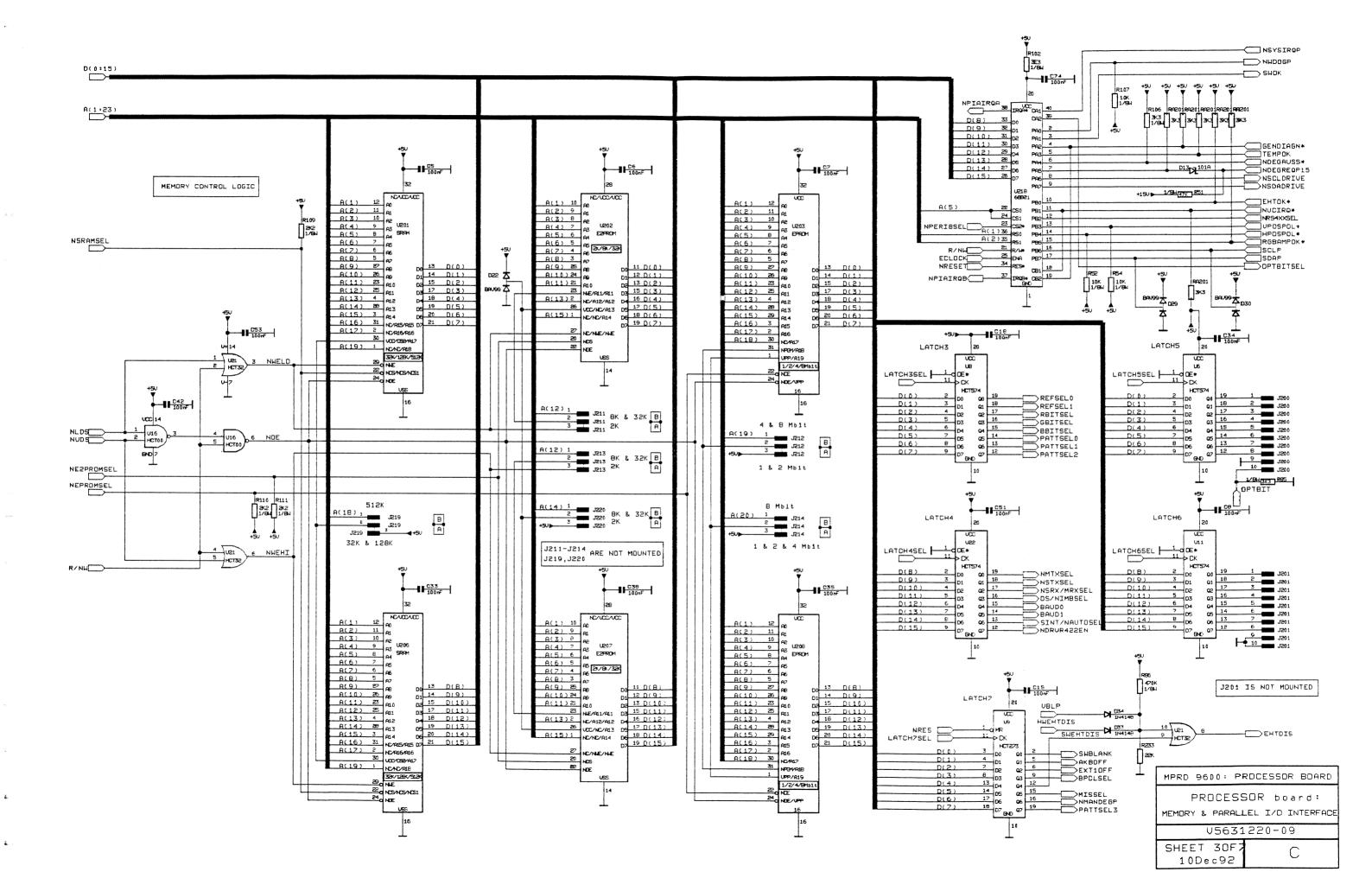
Reinstallation:

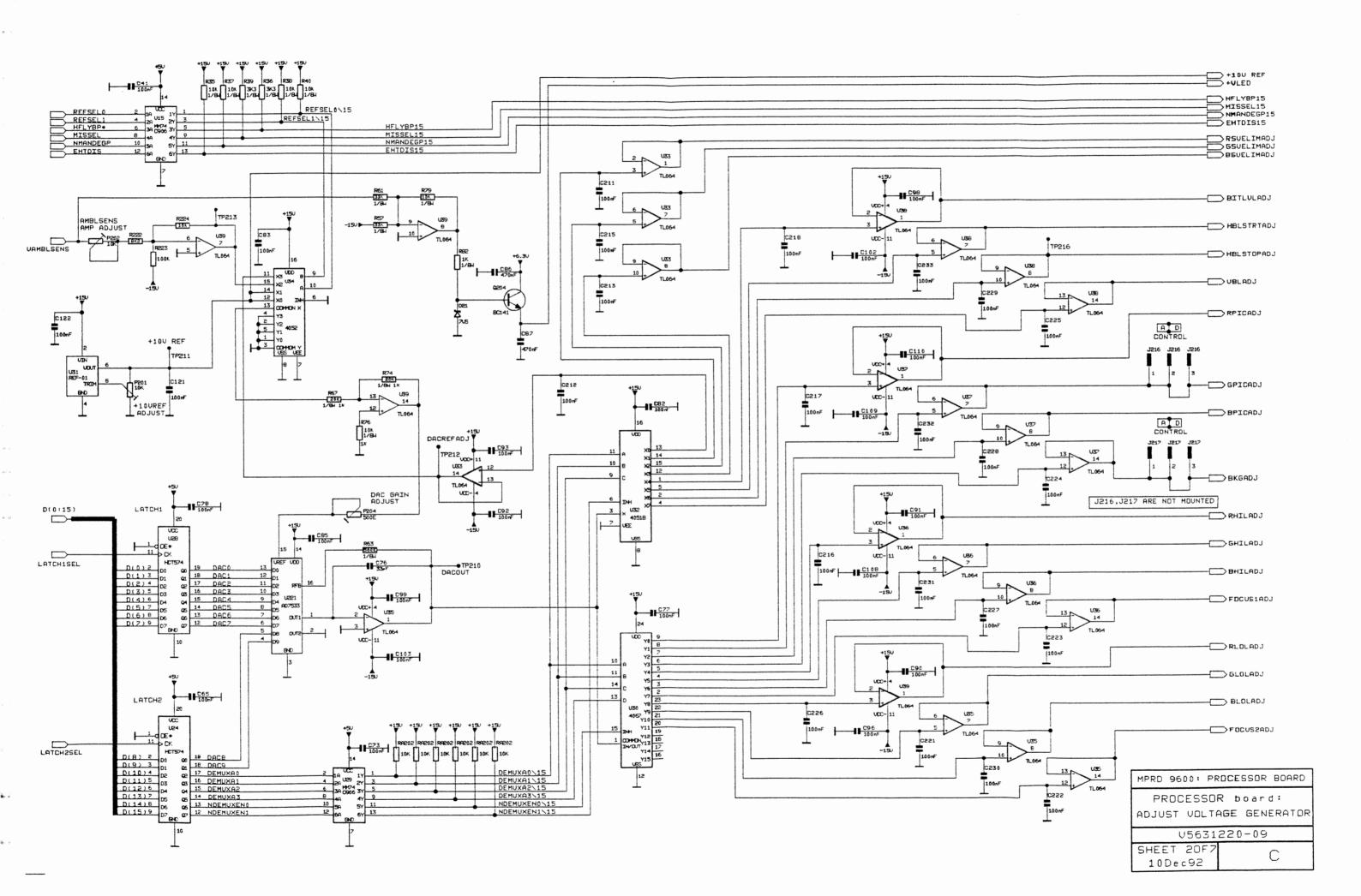
- install the MIS board on its metallic mounting.
- reconnect the connectors on the MIS module.
- reinstall the metal plate on which the MIS board is mounted.
- install the cover on the display by way of the 34 captive screws.

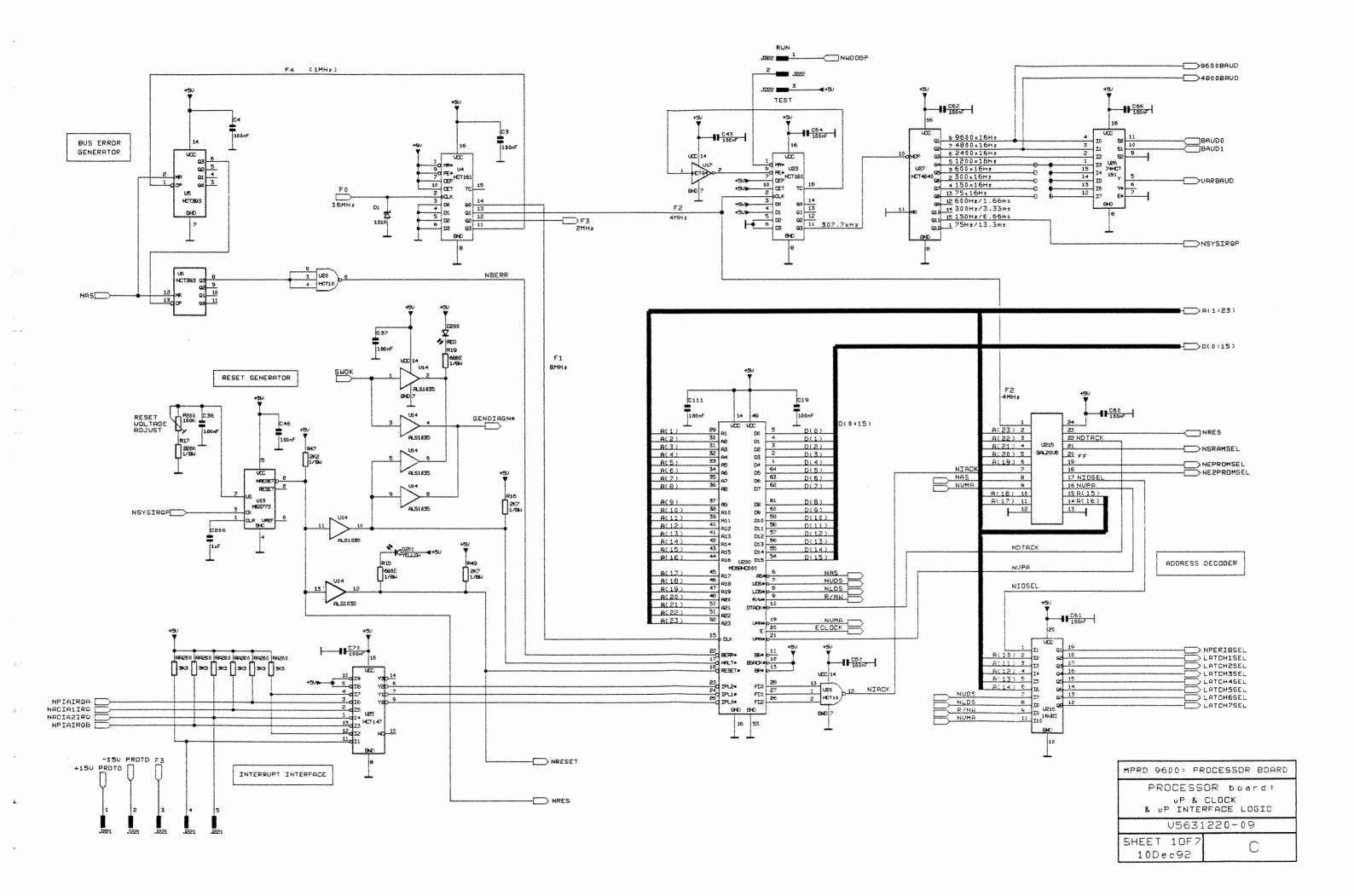
Optional Input board

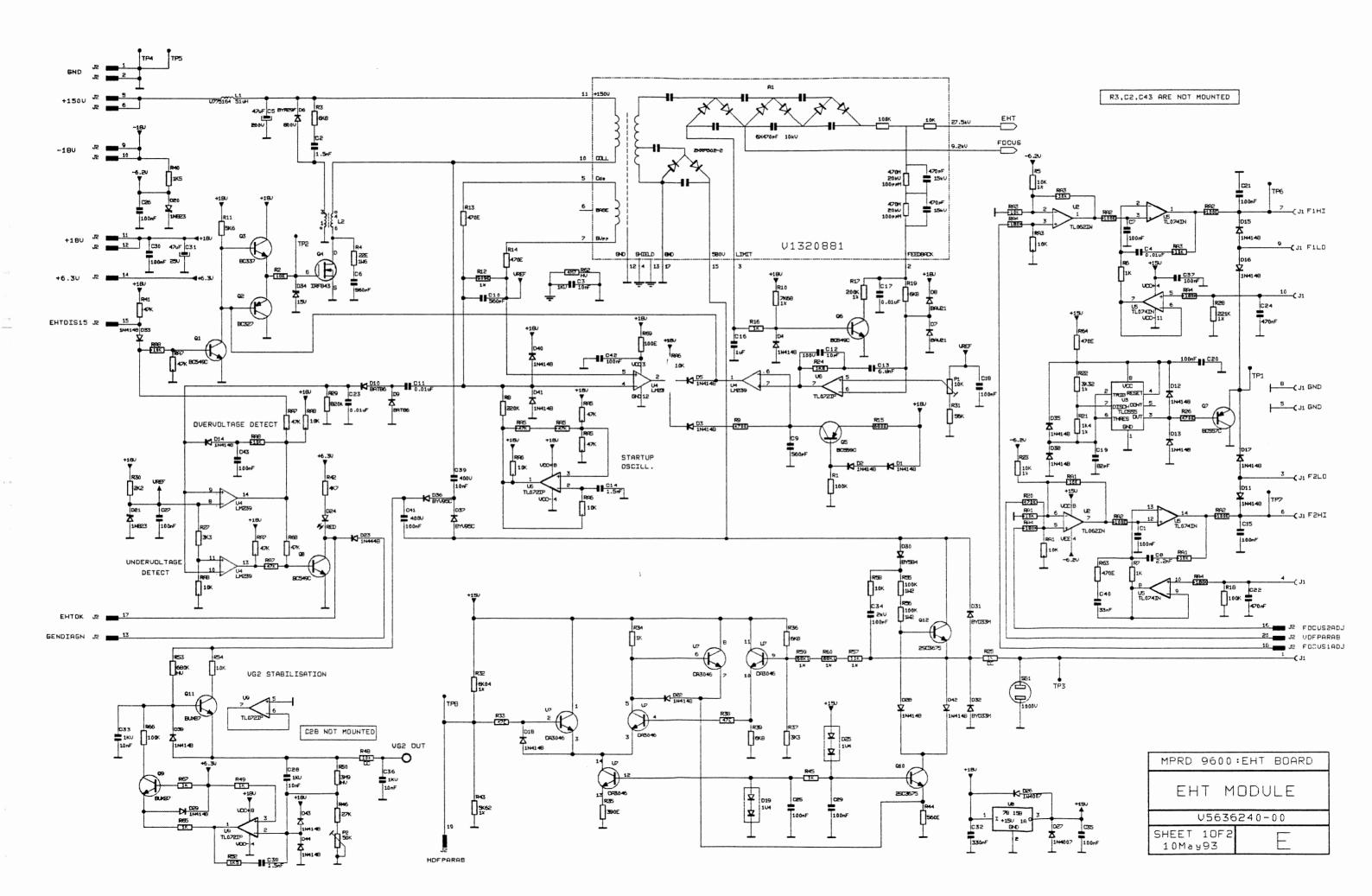
Removal

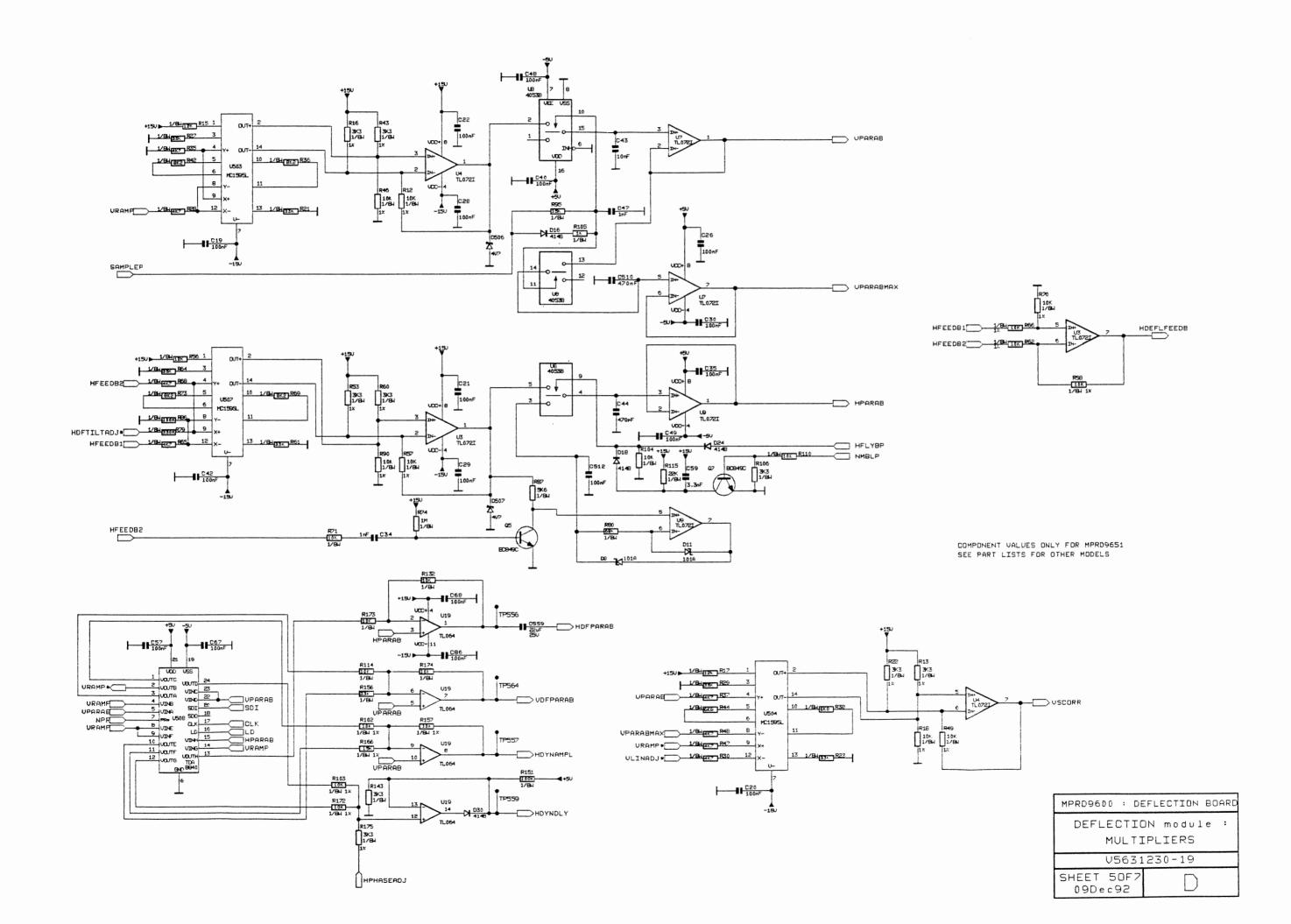
- unscrew the 2 captive screws fixing the optional input board to the rear of the display.
- pull out the optional input board using the maintenance key (V603790).
- unplug the 3 coax cables, one for each colour R, G, B of the BIT signal
- Reinstallation:
- plug the 3 coax cables (a colour code is present on each of the 3 wires).
- push the board back into position.
- fix the board onto the chassis by way of the 2 captive screws at the rear.

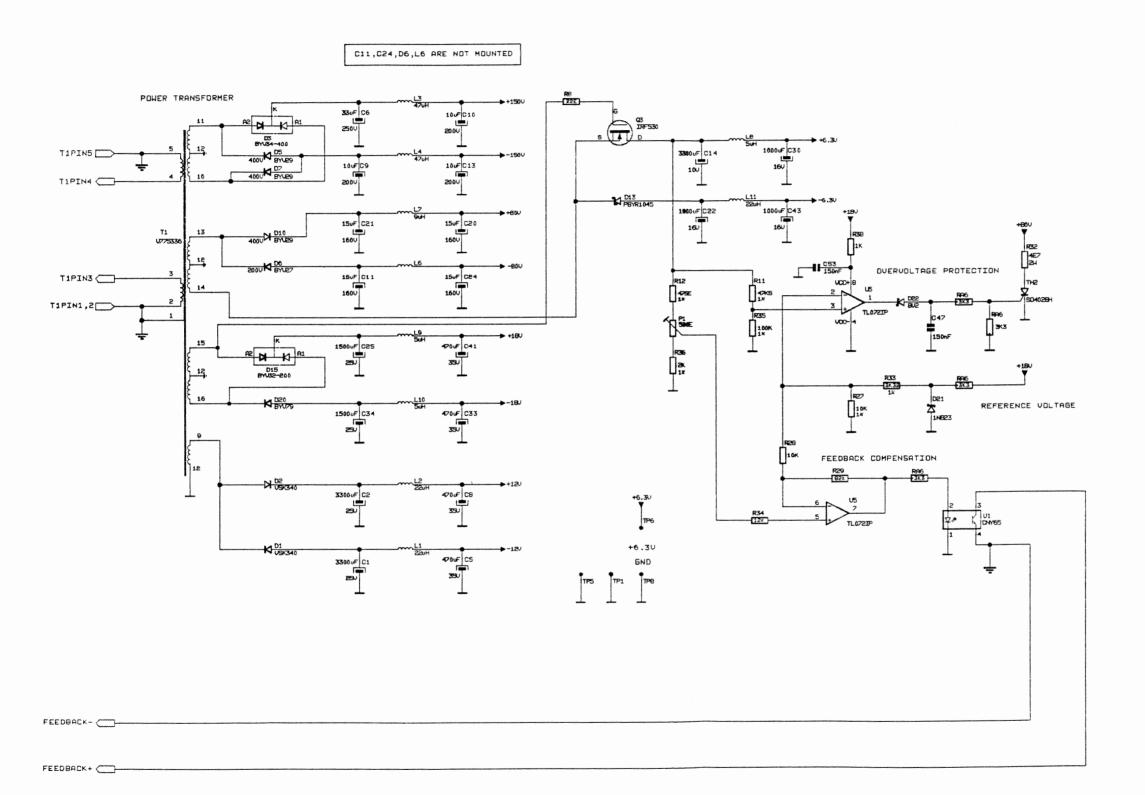


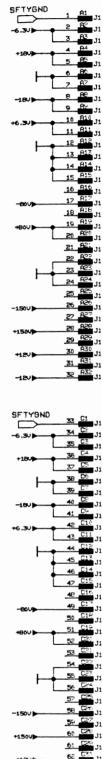




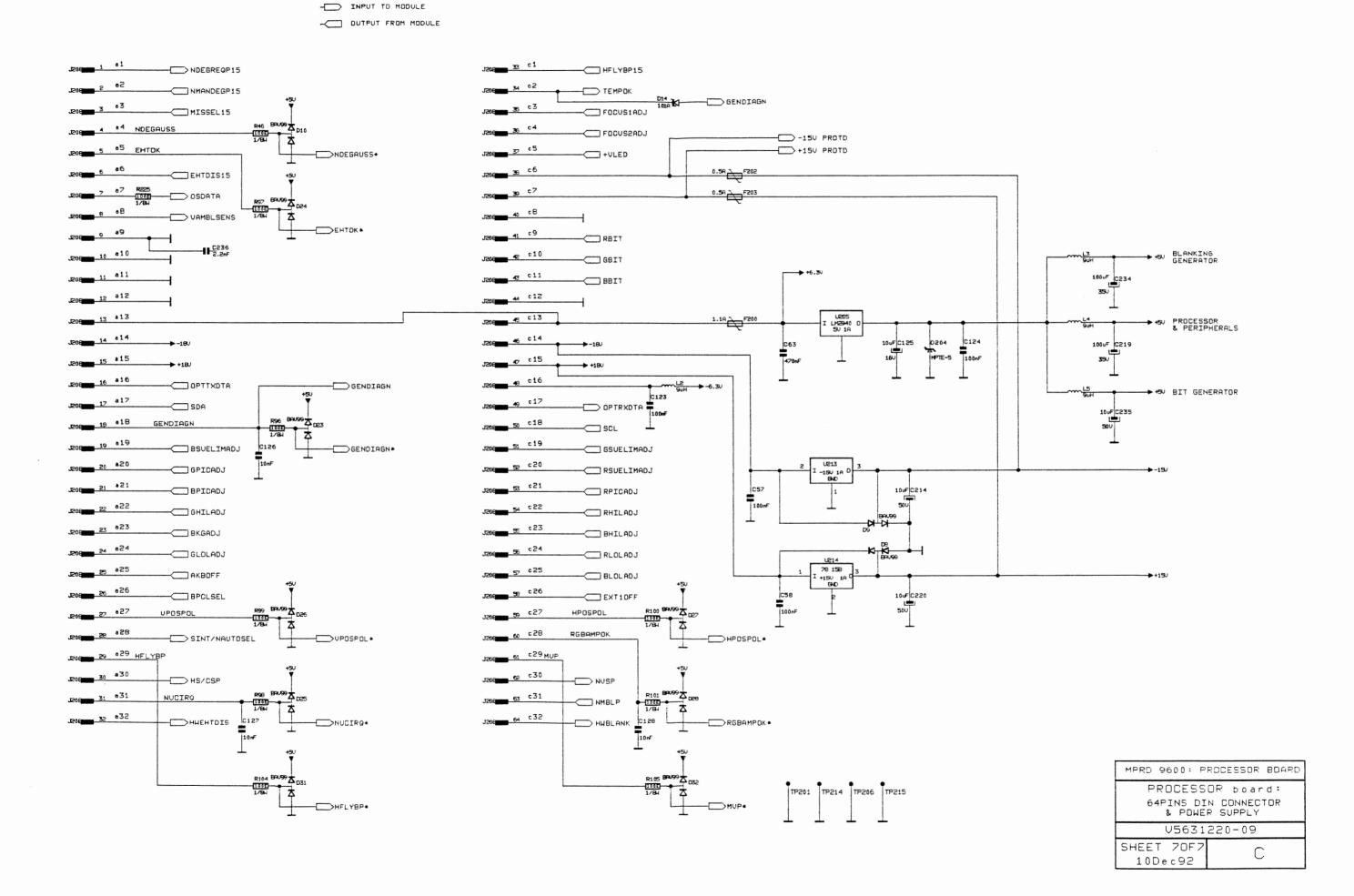


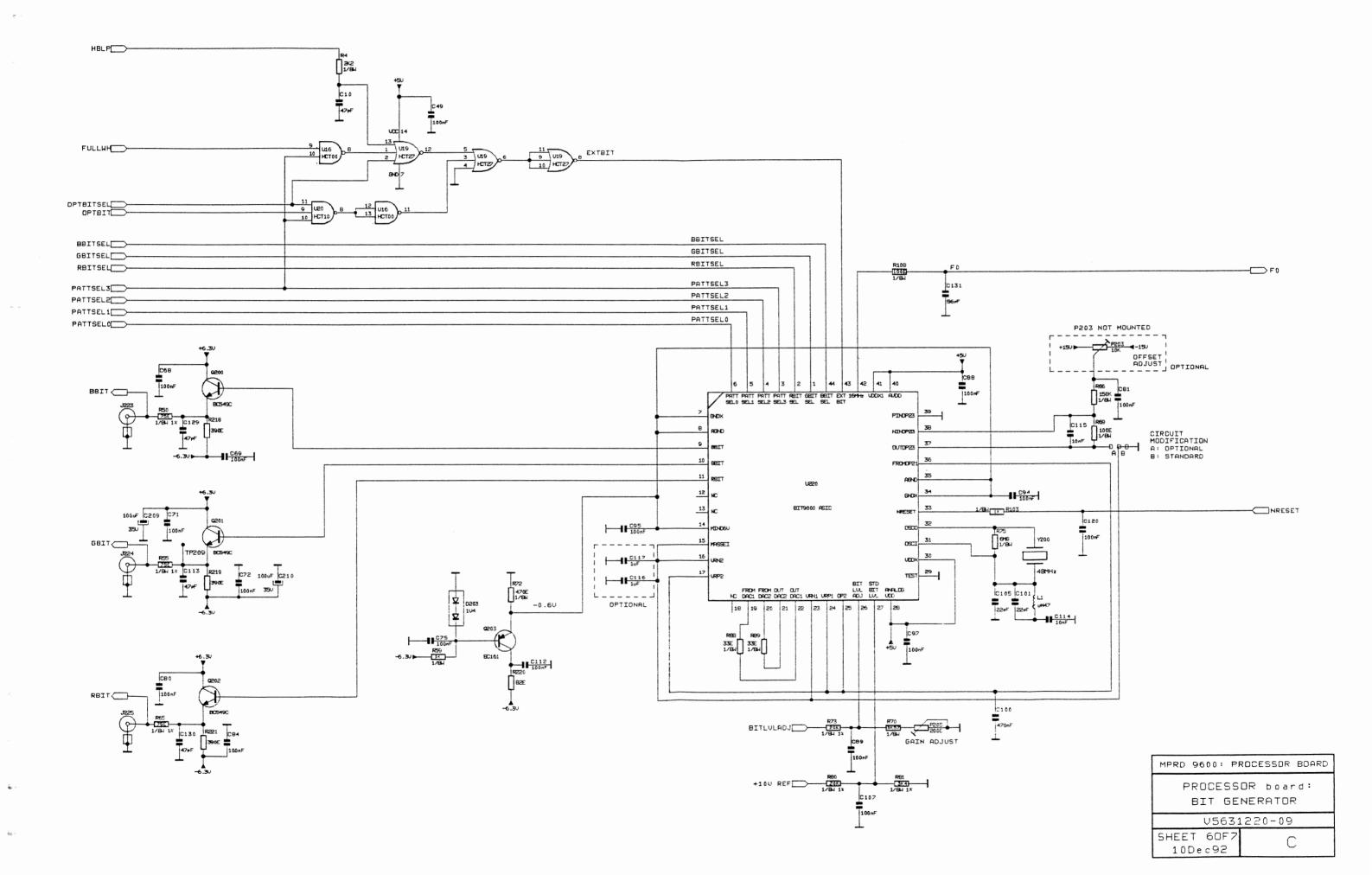




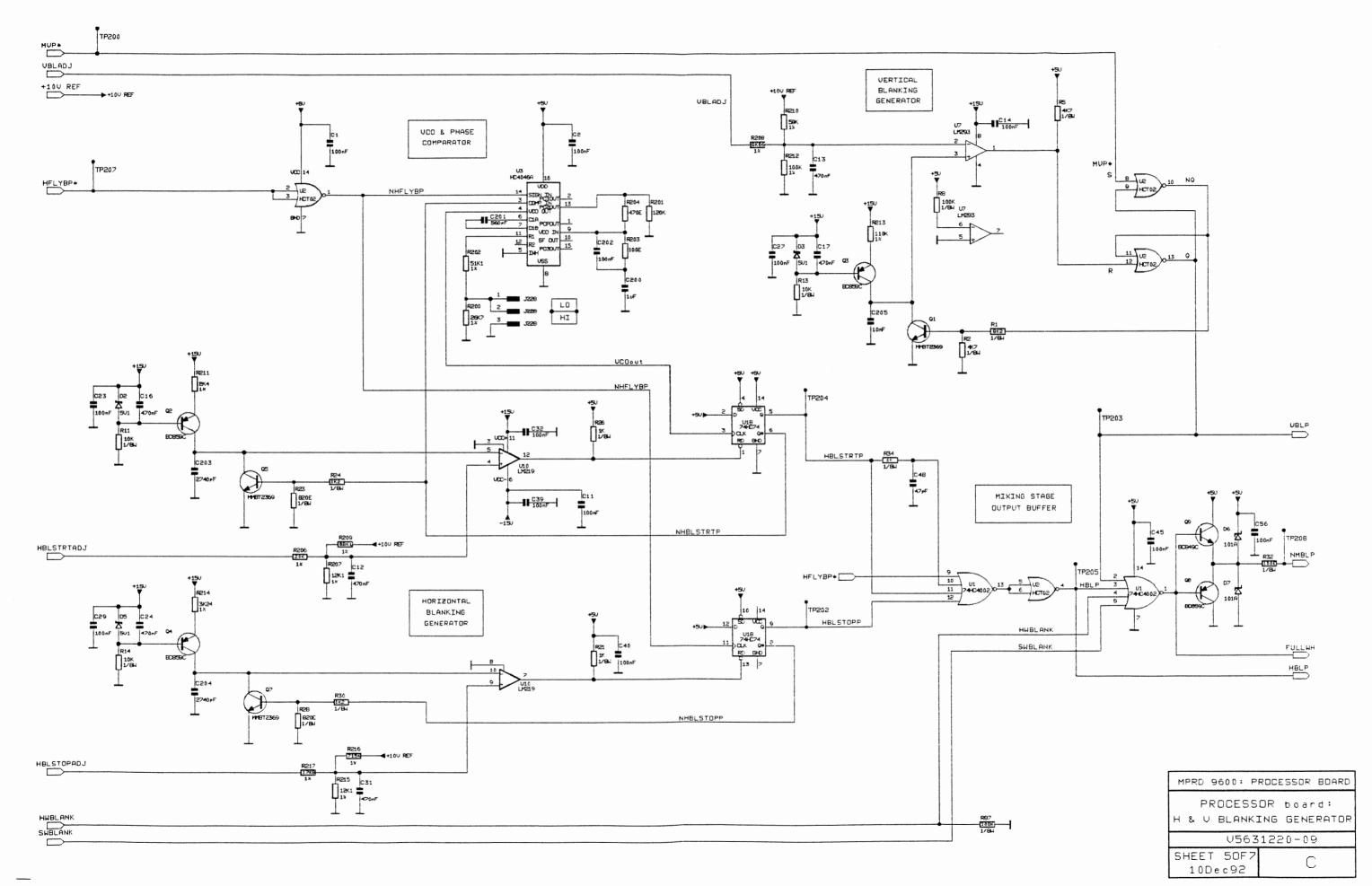


MPRD 960	:PS BOARD
POWER SUPP	LY 115/220V
main modul	e:SECUNDARY
V56312	270-11
SHEET 20F2	
27Jan93	





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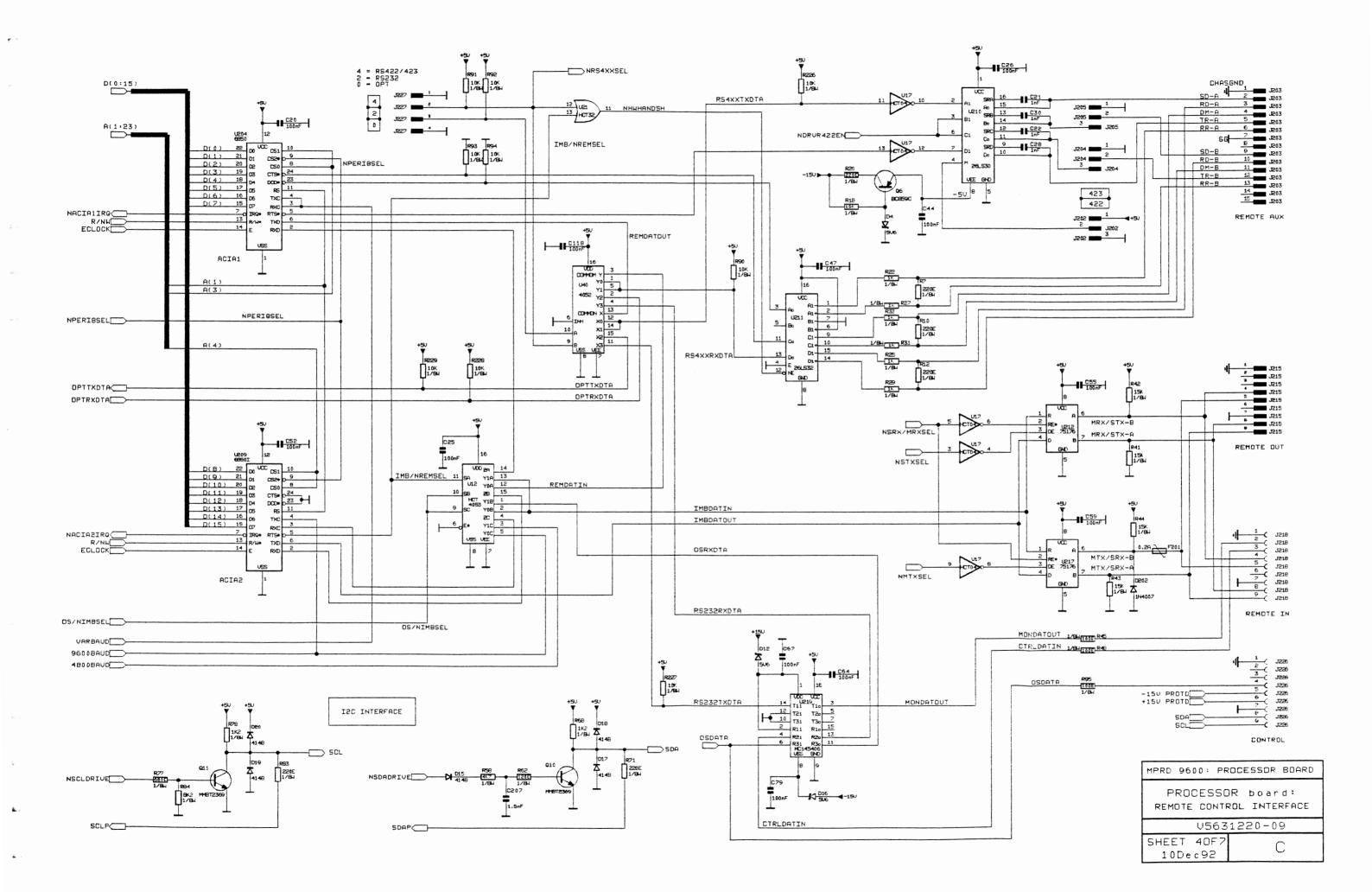
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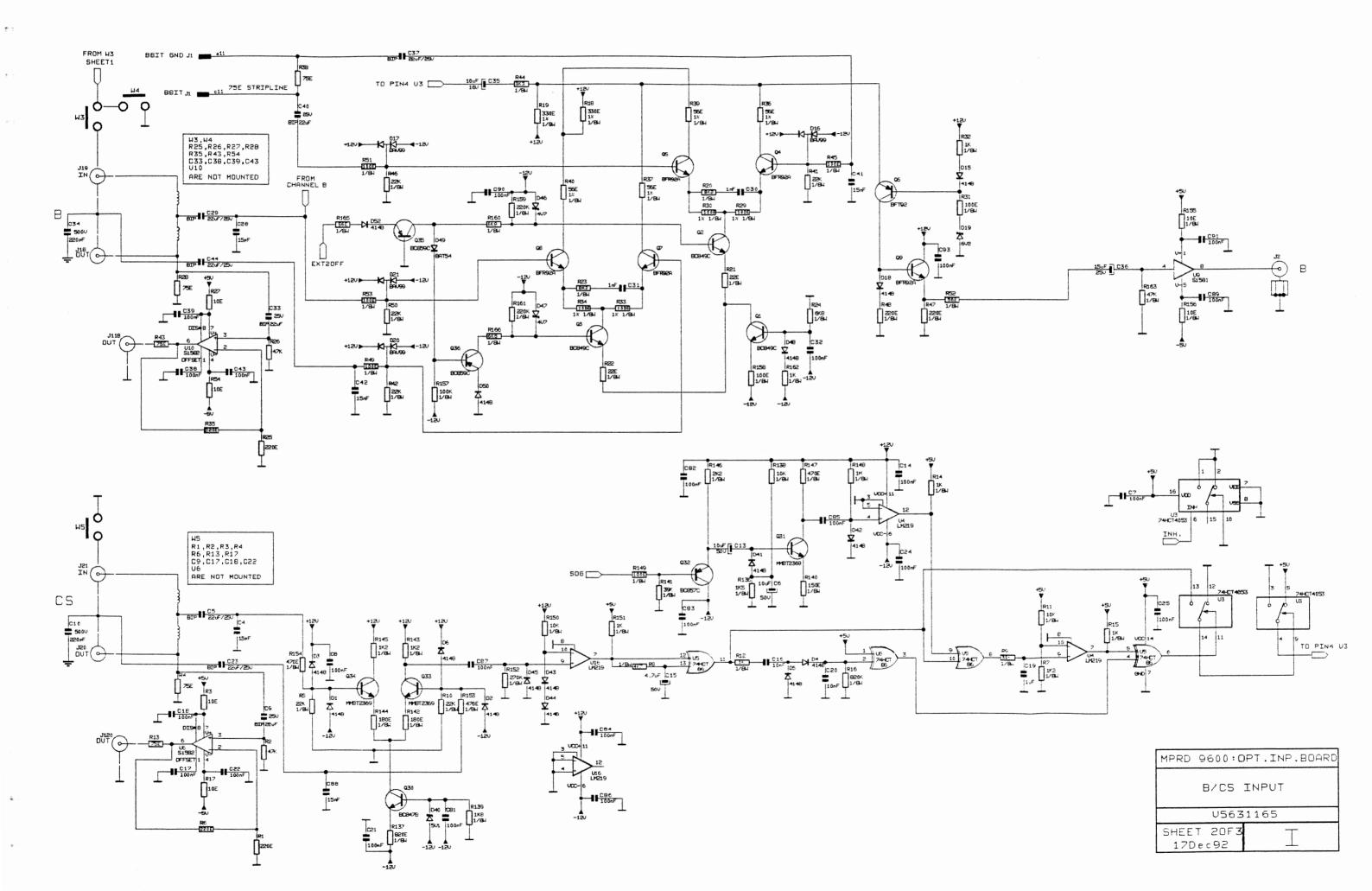
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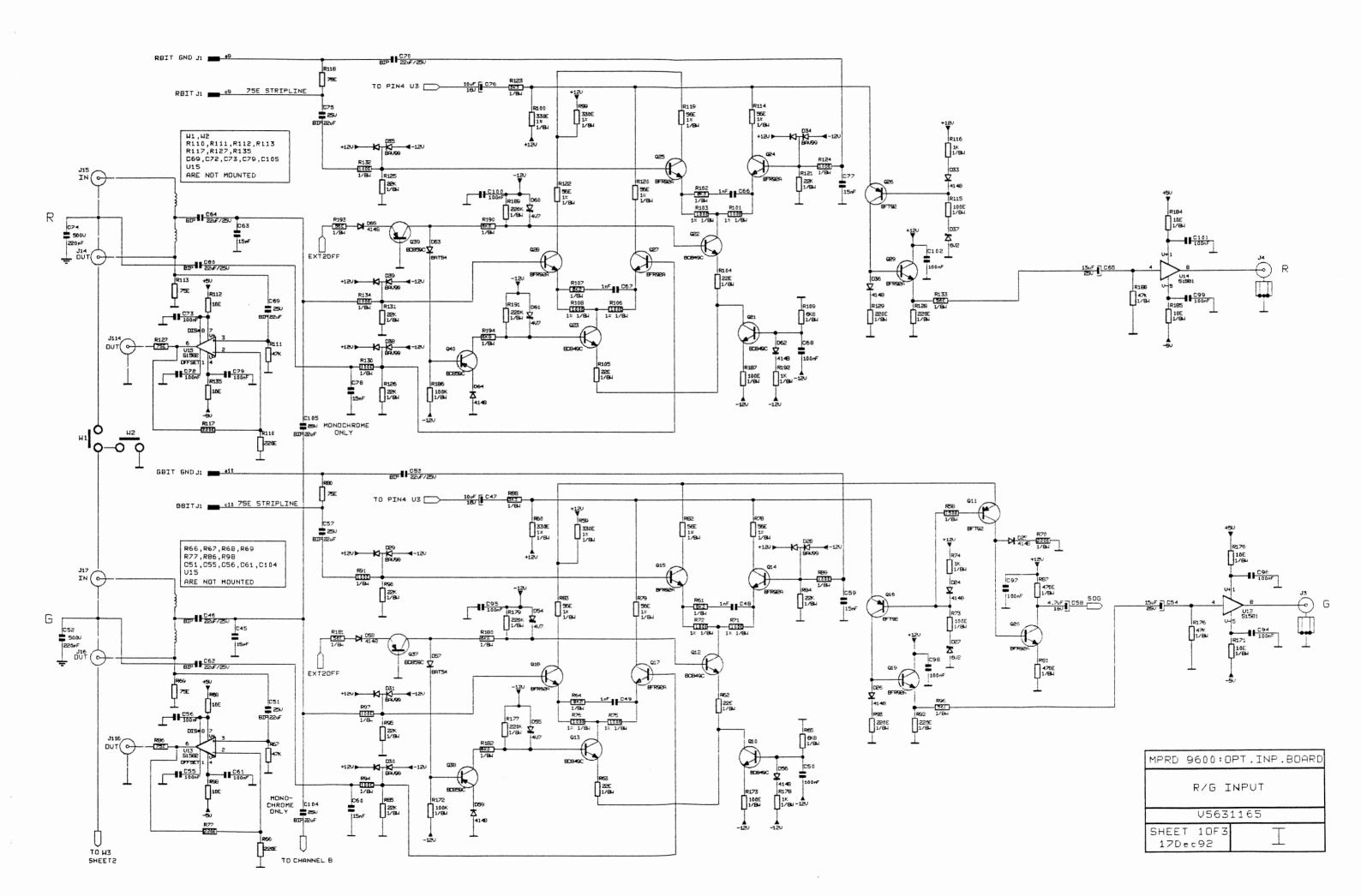
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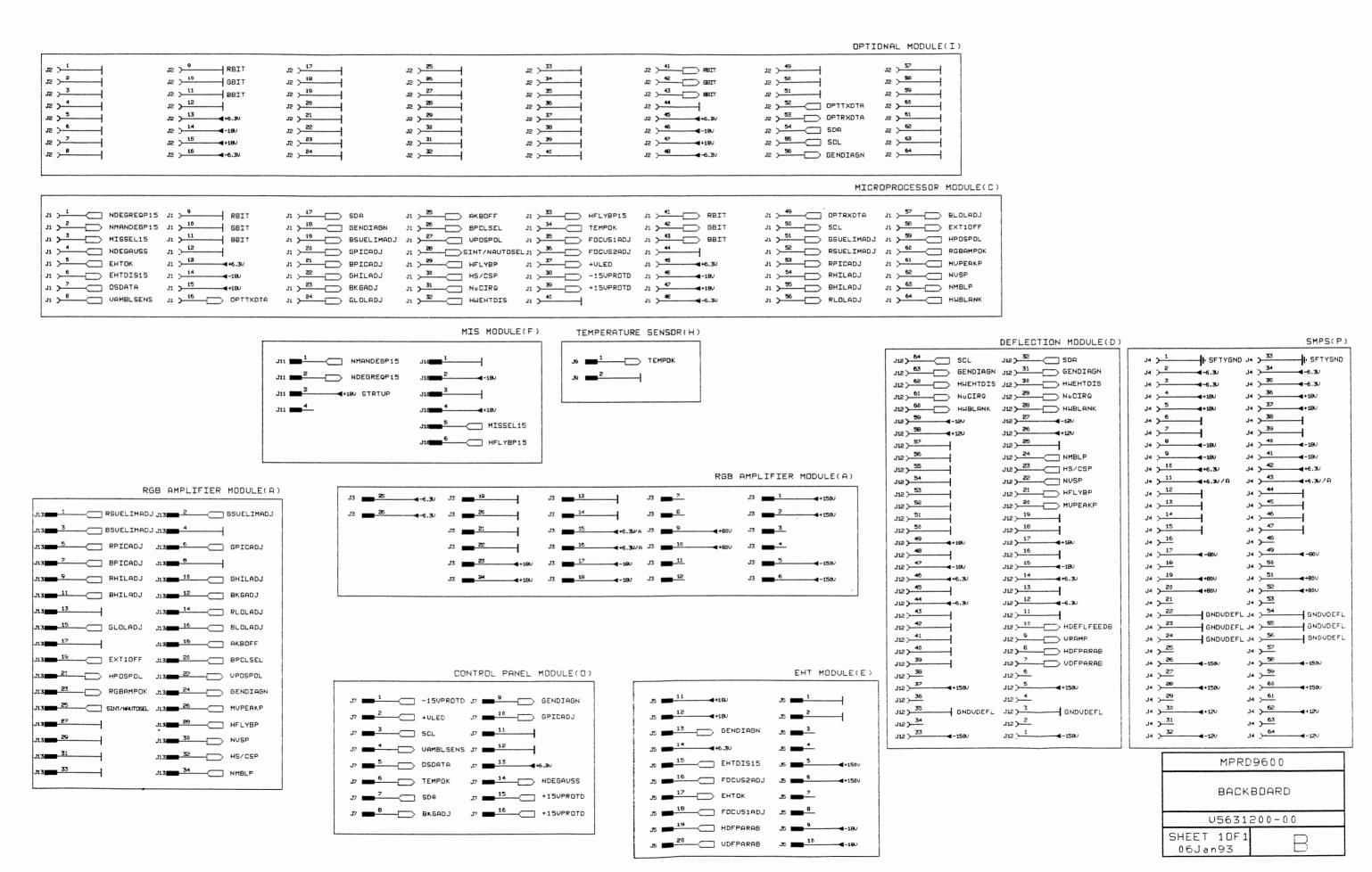
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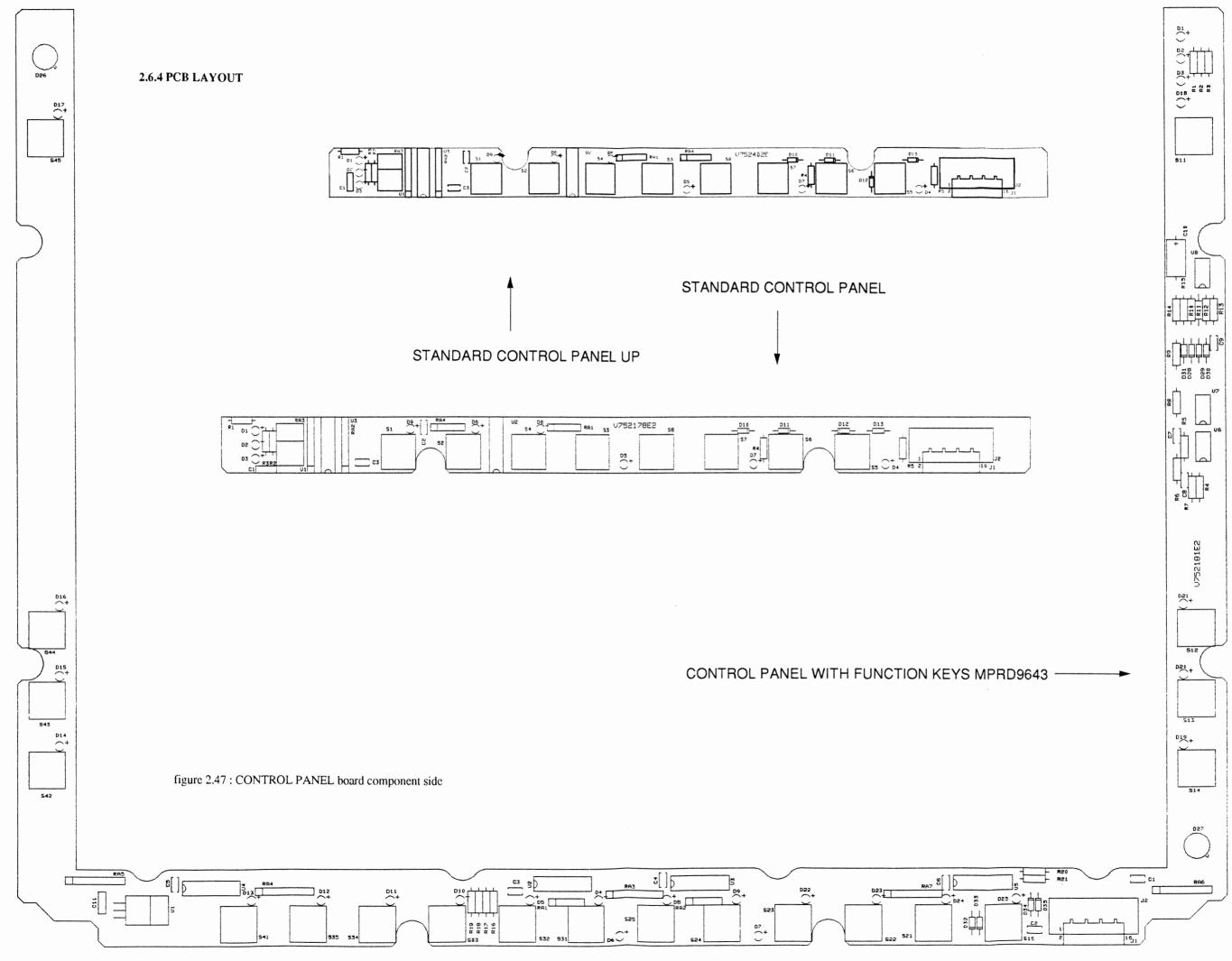


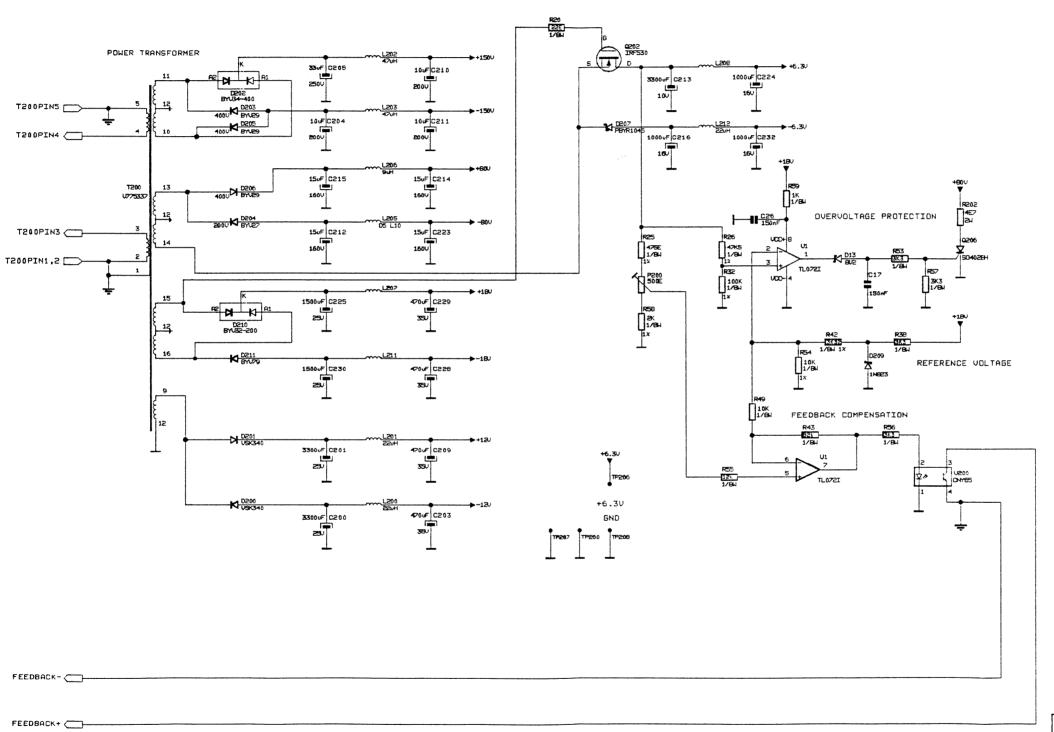
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514 0 F18 9 F17 FLAT CABLE CON 16P KEYCOL1 KEYCOL3 KEYCOL4 KEYCOL5 MALE \$23 Q F 9 \$21 Q F11 9 531 9 F6 | REE | REE | REE | REE | REE | KEYROW1 KEYROW2 KEYROW3 544 0 F13 10uF C4 **₩** SUBD 9P FEM. F5 R1 POWERLED BKGCAL PICCAL **★**KI^{AETTOH} _(J2 SDA +VLED JI F7 N N DO OVERTEMPLED FB U1 1: 1::12940 0 5:V 1:A GENDIAGN J1 = M_{YELLOH} +6.30 Ji 13 FAULTLED F3 F2 **₹**ND13 F1 5 J2 -15V PROTO PROTO J1 N_{YELLOH} —(J2 DSDATA F15 F14 —(J2 +150 PROTD __(JZ MGND F13 D29 5KII R11 N_{YELLOH} ALT D30 22K R12 378 R13 **₩** ND18 PROTO Ji 16 MIS F18 250E R96 F17 UDC-4 VAMBLSENS J1 F16 4.2uF C10 N YELLON F9 F10 MPRD 9643L/9651L F11 CONTROL PANEL F.K. F12 U5631265-00/U5631261-00 SHEET 10F1 0 11Dec92

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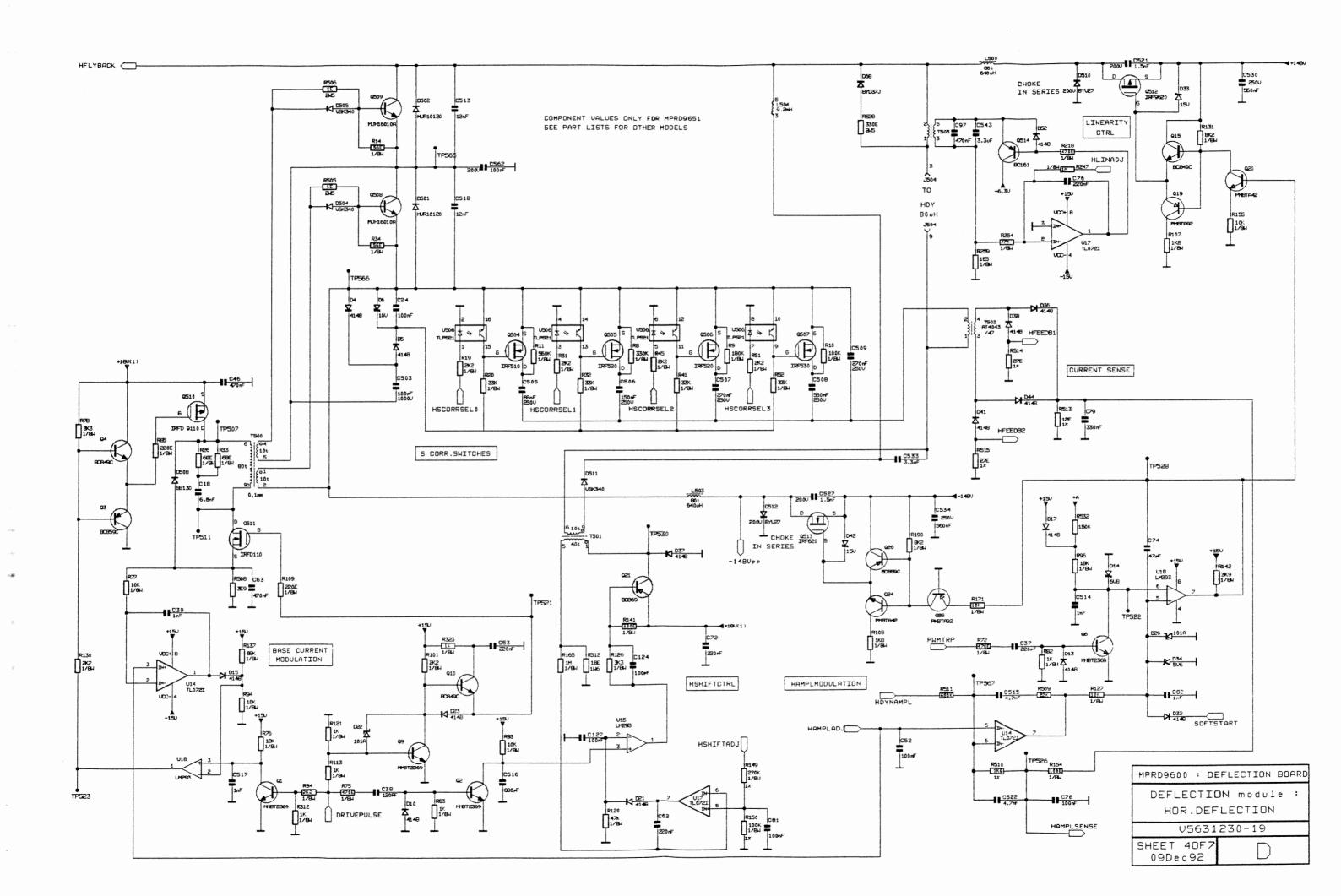


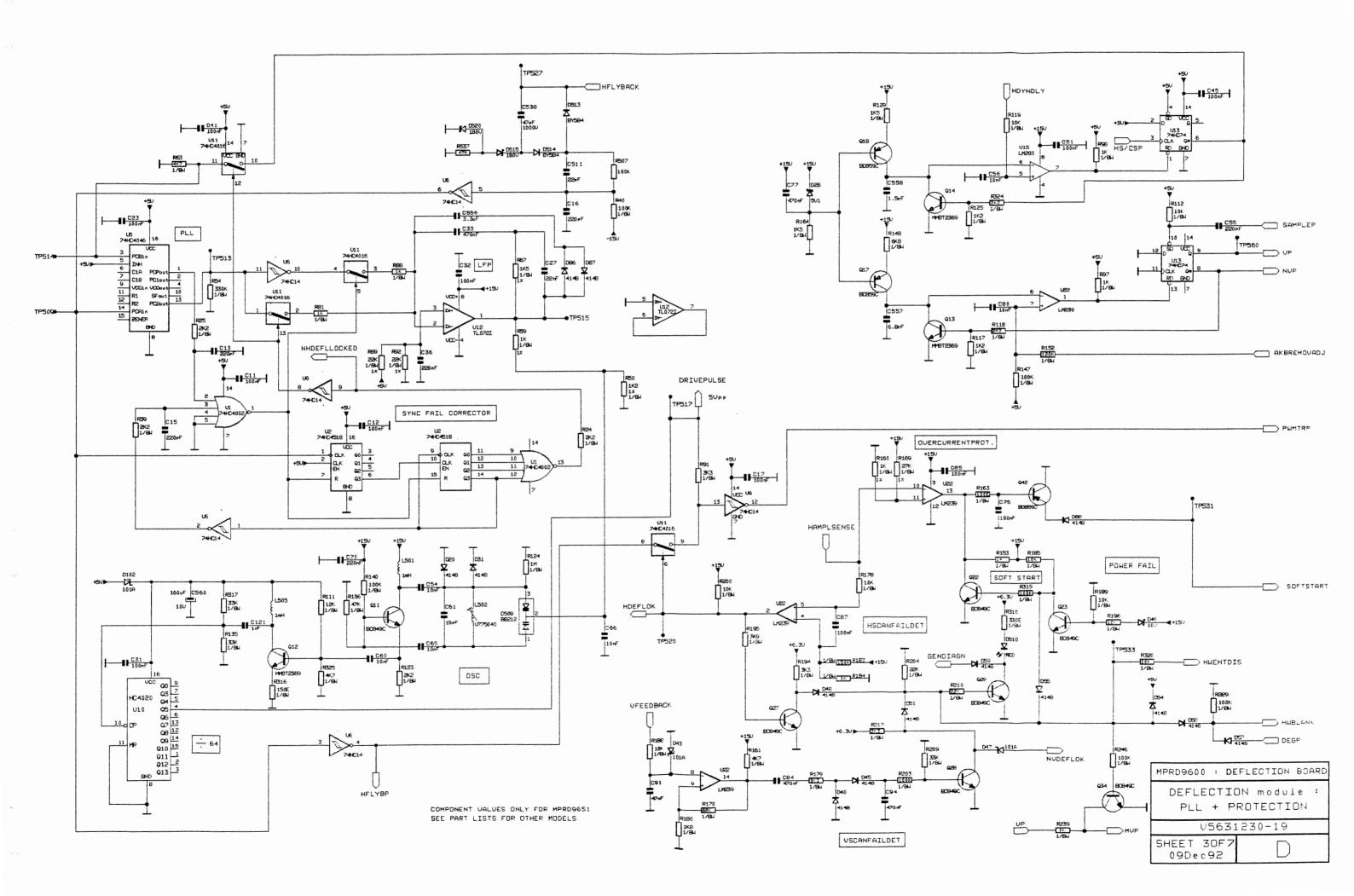
MPRD 9600:PS BOARD

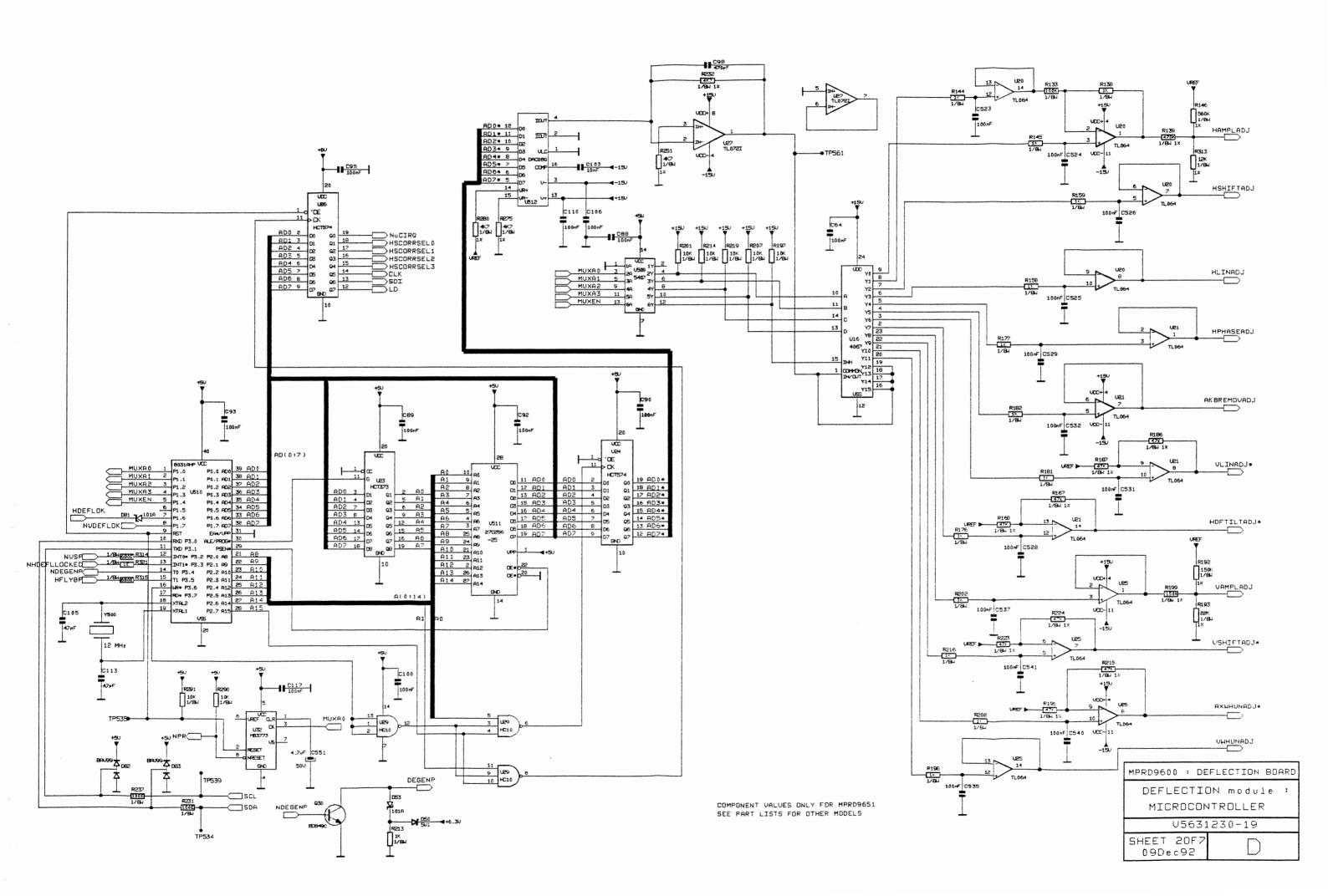
POWER SUPPLY 28VDC
main module:SECUNDARY

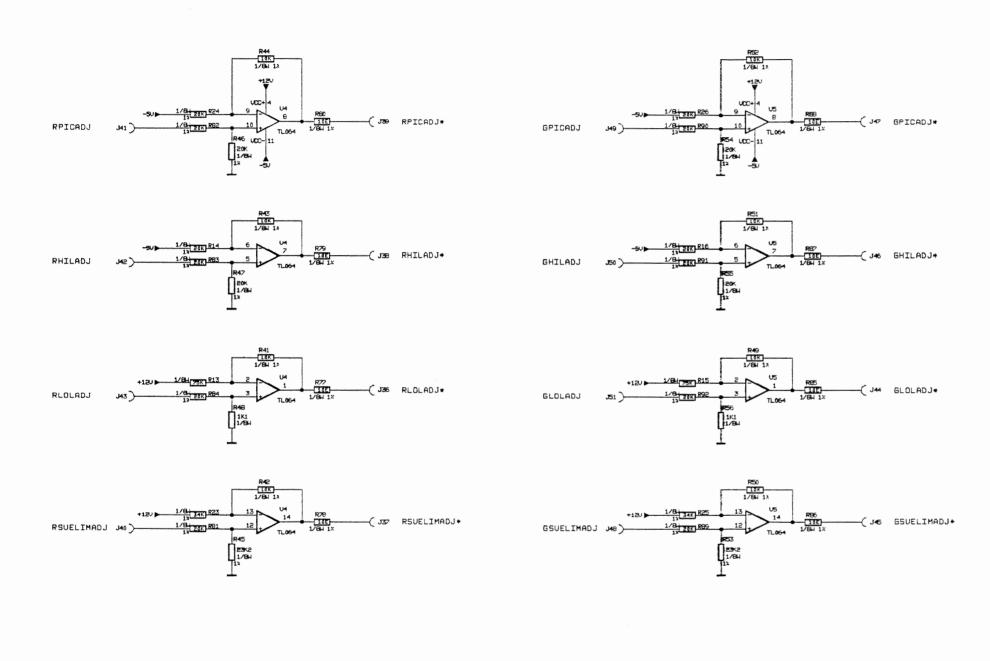
V5631271-14

SHEET 20F2
27Jan93

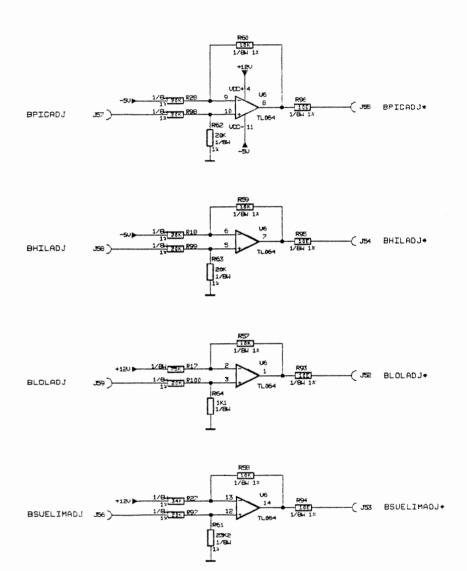


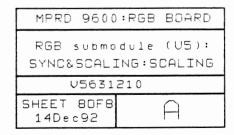


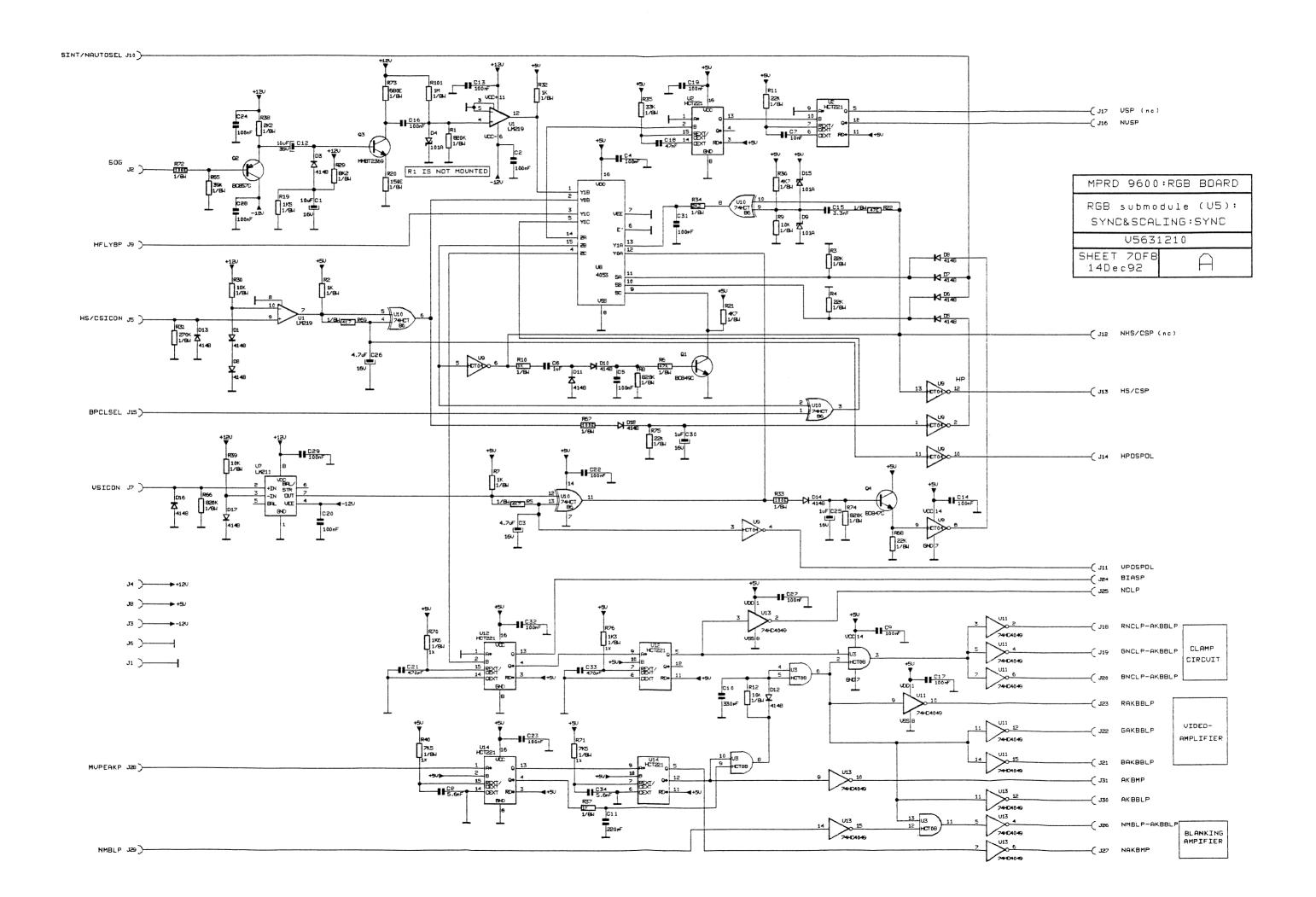


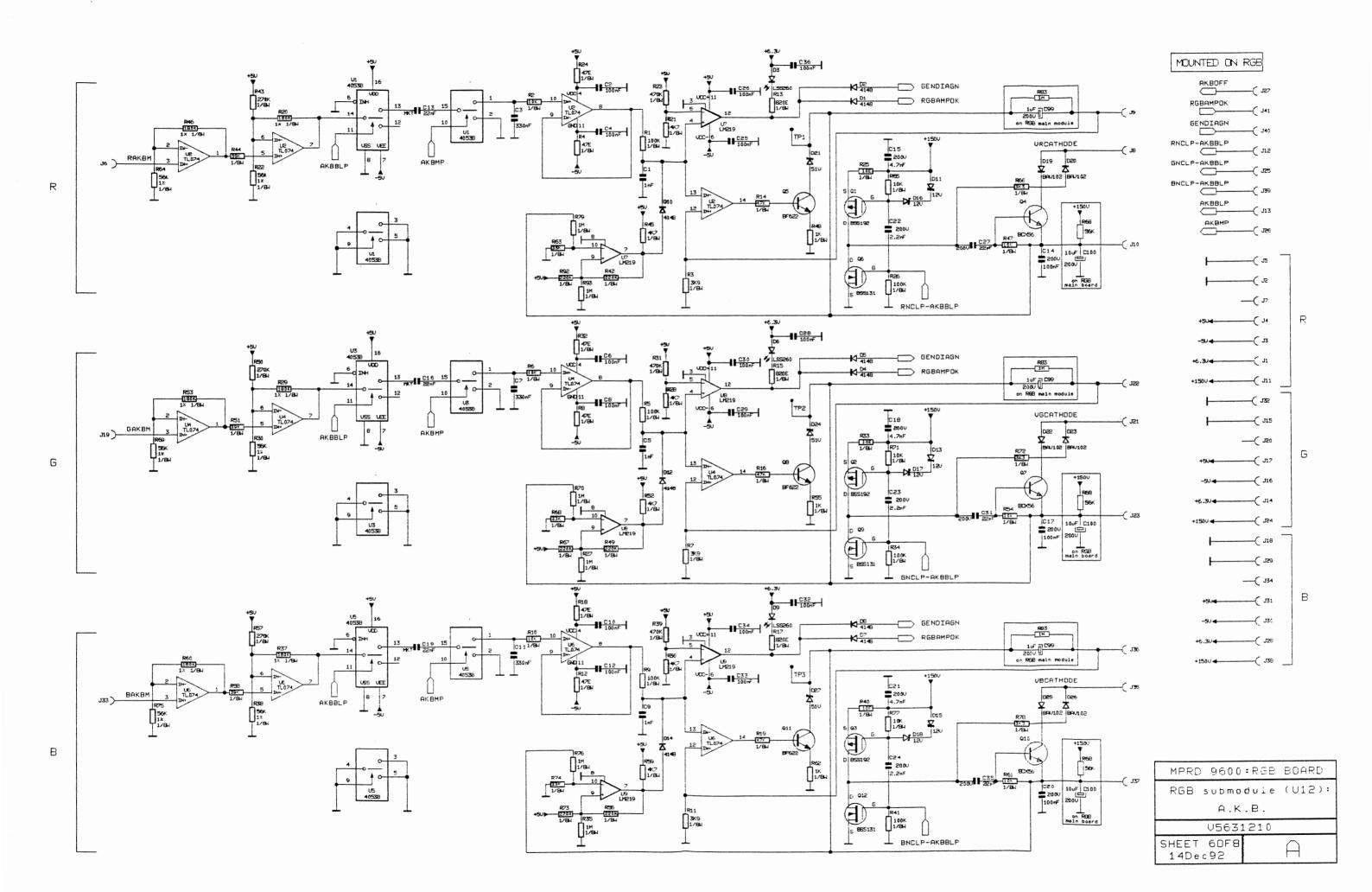


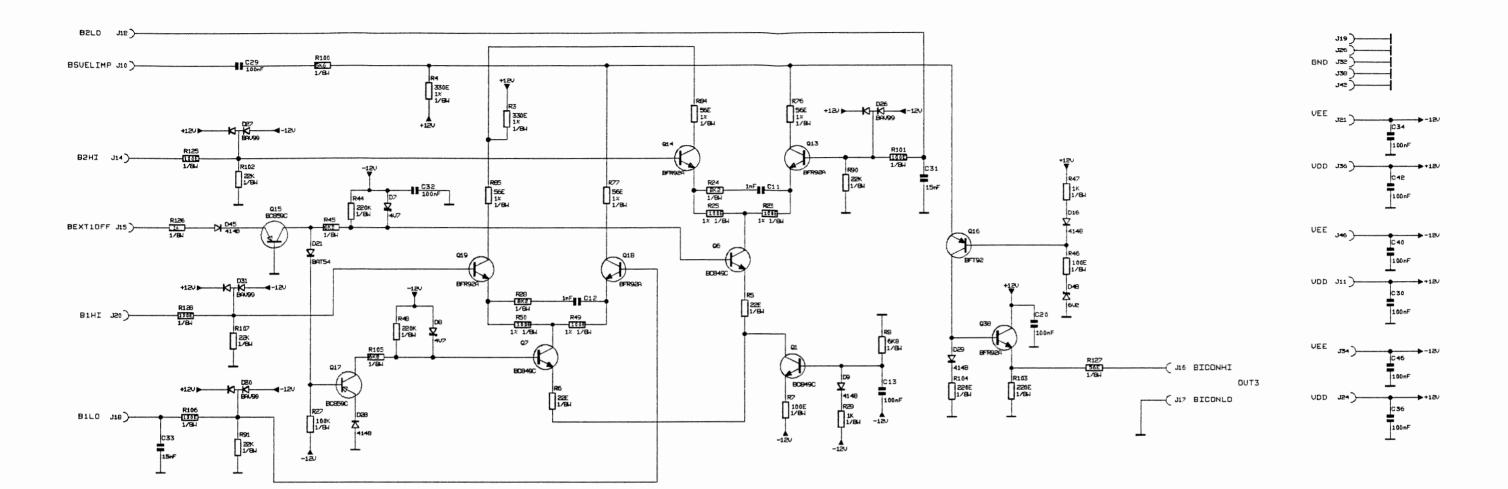
.. INDICATES ADJ-UDLTAGE AFTER SCALING

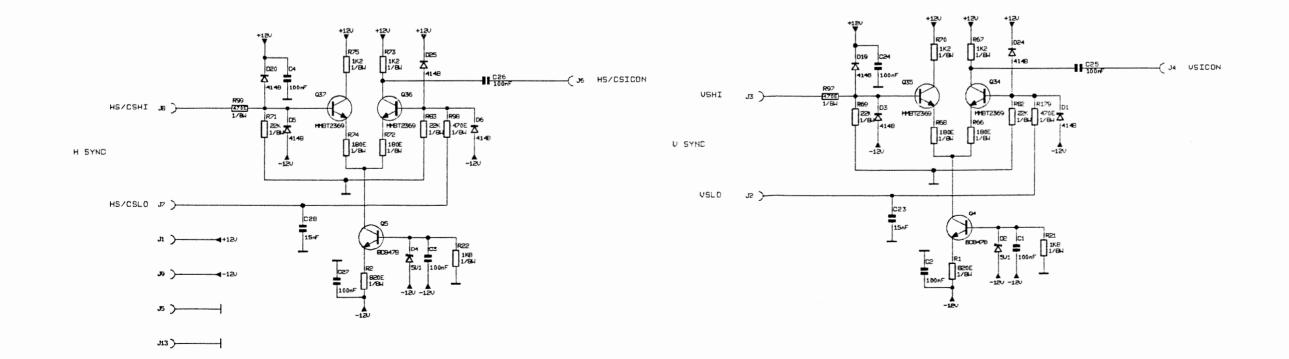




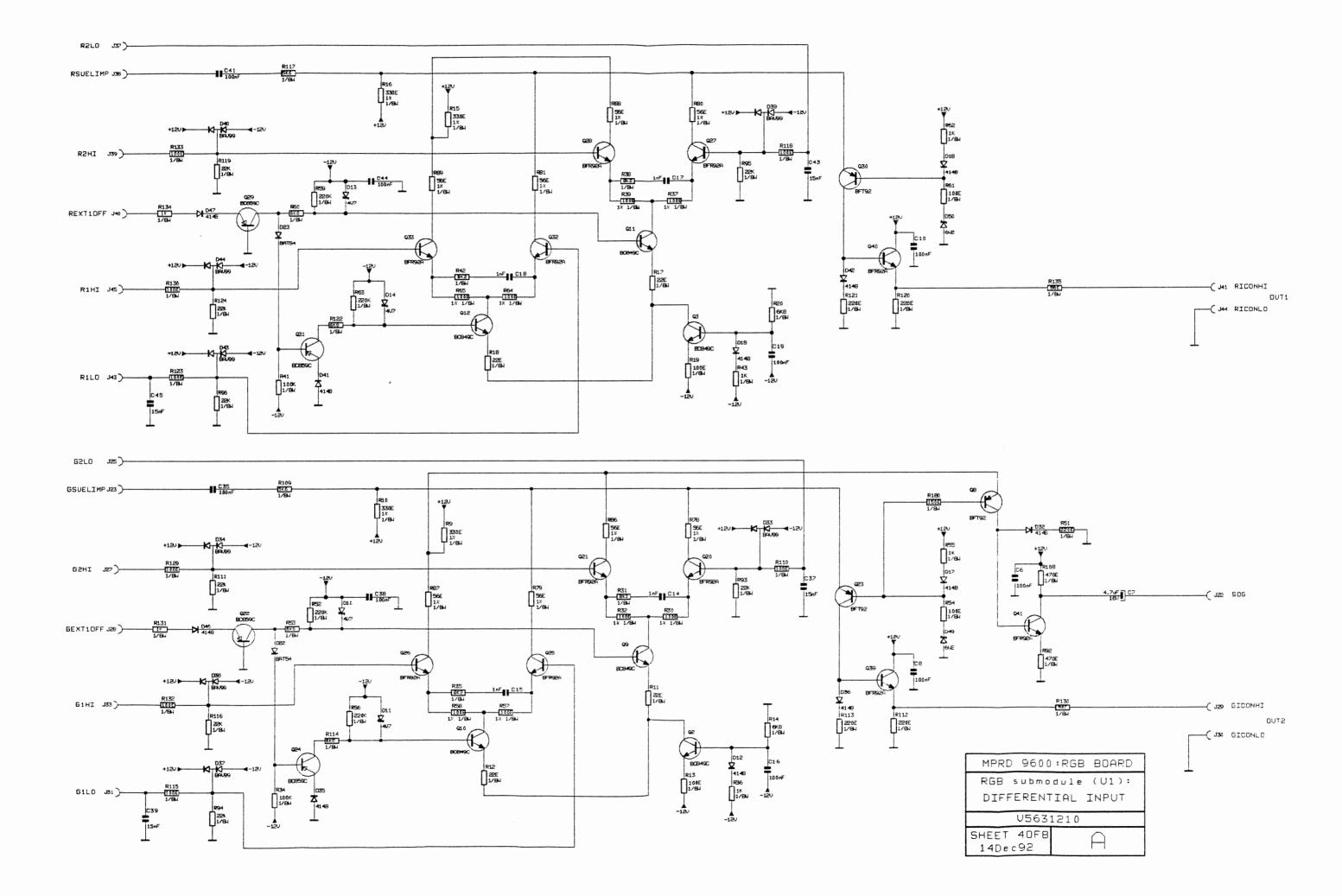


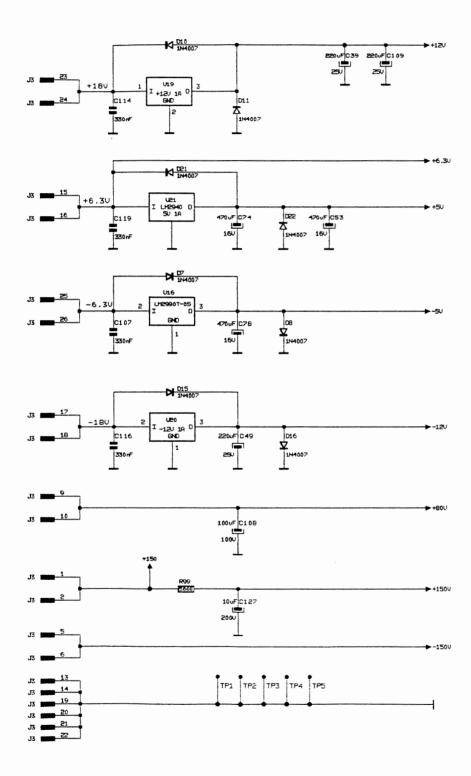


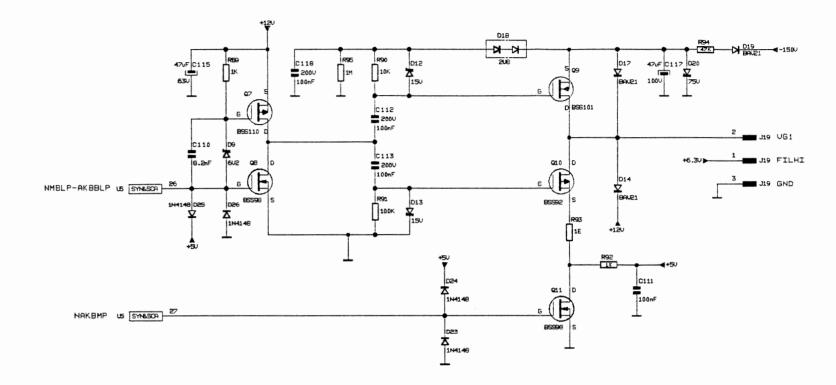




MPRD 9600:RGB BOARD		
RGB submodule (U1):		
DIFFERENTIAL INPUT		
V5631210		
SHEET 50F8 14Dec92	A	







MPRD 9600:RGB BOARD		
RGB main	module:	
POWER&BLANKING		
V5631210-12		
SHEET 30F8 14Dec92	A	

